



SENSICK opto-electronic sensors

the automation controls specialist

# <u>ADCON</u> ENGINEERING

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Manufacturer's Representative

For Electrical Controls
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# SENSICK opto-electronic sensors

# Over 40 Years Experience in Optics and Electronics



At the Waldkirch works, specialists solve problems from all over the world - using light

Light is the medium of the future.

When used in conjunction with precision optics and intelligent electronics, light solves numerous technical problems: non-contacting, quickly, reliably and accurately.

The Optics Engineer Dr. Erwin Sick foresaw these possibilities and founded his company in 1946. Today, there are some 1700 persons employed in the works of Waldkirch, Munich, Reute and in the subsidiaries all over the world.

Opto-electronical sensors and systems are essential components in nearly all branches of the manufacturing and processing industries - and SICK offers comprehensive programmes and optimum solutions to all the special problems of these industries.

SENSICK Photoelectric Switches and Proximity Switches for the automation technology.

Safety Light Curtains and Light Grids for accident prevention on dangerous machines and plants.

Environmental Systems for emission monitoring and for measuring visibility and pollutant concentrations.

Bar Code Reading Systems for the detection of process data to control material flow.

Laser Scanners and Image Processing Systems for visual quality control.

More than 300 patents bear witness to the company's innovative spirit and technical know-how.

SICK offers high-quality products using modern technology in research, development and manufacture. Expert advice and a qualified Service System ensured by numerous sales offices in Germany, by the subsidiaries in France, Switzerland, Belgium, Netherlands, Great Britain, Denmark, Spain, the U.S., Australia and Japan as well as by the representatives in all important industrialized countries are an essential part of our efficiency.

Whenever problems in automation technology have to be solved economically and efficiently with opto-electronic sensors, SICK will be your partner.

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### **Selection criteria**

The vast number of day-to-day production problems is matched by the plethora of devices available to solve them. This Photoelectric Switch Catalogue has been designed to help customers in choosing the appropriate device. But firstly a few words to explain the use and operation of the devices.

A main criterion in the selection process is the Scanning Range (Photoelectric Switches) and the Scanning Distance (Photoelectric Proximity Switches). This is clearly indicated both in the introductory pages and on the data sheets. Depending on the specification, it is the operating range and/or the limit scanning range. With regard to the limit scanning range, it should be borne in mind that, in a dusty atmosphere for example, this distance may be reduced by dirt on the optics. In such cases, a device for a correspondingly greater distance should be chosen.

### The operating voltages

are indicated in the Technical Data, in some cases as (absolute) limit values, in other cases with permitted tolerances.

The values given (e.g. lifetime of the LEDs) relate to an ambient temperature of +25°C.

The devices are grouped into categories: through-beam photoelectric switches; photoelectric reflex switches; photoelectric fiber-optic switches; photoelectric proximity switches; luminescence scanners.

### **Through-beam Photoelectric** Switch





The through-beam photoelectric switch consists of two devices: a light sender (e.g. WS 27) and light receiver (e.g. WE 27). The separate construction permits large scanning distances with a corresponding reserve capacity. It is ideal for use in unfavourable environmental conditions, e.g. wet, dusty, etc. Blanking enables relatively high switching accuracy to be achieved with low tolerances in relation to the repetition accuracy. Such an arrangement is also largely free from disturbance when there are reflecting objects in the light beam. Because there are two devices, they are accordingly more expensive to fit.

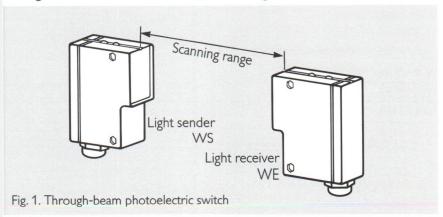
### See Fig. 1

### Photoelectric Reflex Switch



With photoelectric reflex switches (e.g. WL 27), the emitted light is returned by a reflector at a distance not exceeding the scanning distance and is evaluated by the device. This system involves less expensive fitting, since installation and wiring are only needed on one side. Polarizing filters prevent maloperation when reflecting objects are picked up, but one must ensure that the reflectors quoted are used.

See Fig. 2



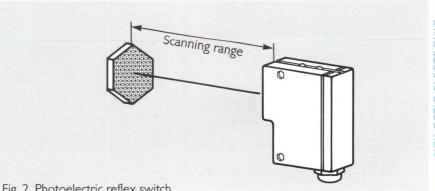


Fig. 2. Photoelectric reflex switch

# Photoelectric Proximity Switch Photoelectric Fiber-optic Switch Contrast Scanner

## Photoelectric Proximity Switch

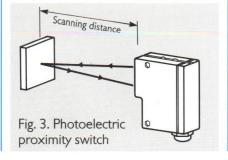


With a proximity switch (e.g. WT 27), unlike the reflex switch, the light is reflected by the material itself. The beam is focussed to increase the sensitivity of the system. Materials with a matt black surface, with a reflectance of at least 6 %, can be reliably detected. In simple cases, the scanning distance can be "tuned" by reducing the sensitivity (sensitivity control), but it is more effective to adjust the scanning distance mechanically or geometrically. This facility is offered by proximity switches equipped with background suppression.

Angular reflection scanners are devices which have a particularly wide angle between light source and light receiver system. To achieve greater switching accuracy, the beams are focussed at the point of intersection of source and receiver.

One special version of photoelectric proximity switches is constituted by registration control scanners, which are particularly suitable for the packaging industry. In such cases, particular attention should be paid to light spot orientation and to the direction of relative movement between proximity switch and the material being scanned.

See Fig. 3



### Photoelectric Fiber-optic Switch





In photoelectric fiber-optic switches (e.g. WLL 10), the light source and light receiver are located in the same housing. By means of flexible optical cables of plastic or glass fiber design, the operating location of the device is transferred away from the operating area that is inaccessible to photoelectric switches or proximity switches. Fiber-optic cables can therefore be advantageously employed under unfavourable conditions, e.g. at temperatures as high as +300°C, in the presence of heavy vibration or aggressive substances.

### **Contrast Scanner**





Contrast Scanners work according to the photoelectric proximity switch principle and are capable of detecting up to 15 different gray scale values between black and white. This characteristic is a prerequisite for reading contrasting marks (e. g. printed coloured marks). In general, colours differ in their respective gray scale value (brightness value). The difference in the brightness of the mark and that of the background - not the colour contrast - is the decisive criterion for readability.

A light source, a LED or an incandescent lamp produces a spot of light at the scanning distance (focus). The reflectance of this surface is evaluated in the contrast scanner. The actual brightness value of the material surface is continuously compared with a preset threshold value (gray scale value). As soon as this switching threshold is exceeded or remained, the switching output changes.

# CK OPTIC-ELECTRONIC

# Luminescence Scanner Distance Measuring Device Temperature Measuring Instruments

### **Luminescence Scanner**



Practical requirements ought actually to be met by a photoelectric proximity switch. This is certainly true in normal cases, but other problems may occasionally arise: for example, a registration mark on an irregular background, e.g. on grained wood, may not be read reliably; "matching shades" also present a standard photoelectric proximity switch with insurmountable reading problems. In such cases, a luminescence scanner (e.g. LUT 1-4) may help. This reacts only to luminescent materials which have been activated by the UV light source in the scanner. Luminescent pigments can be added to the material being scanned or be applied in the form of coloured marks, e.g. chalk.

See Fig. 4.

### **Distance Measuring Device**





The DME 2000 Distance Measuring Device is a high-precision optoelectronic instrument. It measures the transit time of light according to the phase correlation principle using a semiconductor laser which complies with laser class 2. An 8-digit display indicates the measured values; further external processing of the data is realized via a serial interface or an analogue current output. Two switching outputs, with both the switching hysteresis and threshold being selectable at will, undertake direct control functions. A userfriendly menu guidance allows adaptation of the parameters to every individual application in automation without any problem.

### Temperature Measuring Instrument





The TM 20 is a safe solution to all situations where non-contacting detection and measurement of temperatures is required. It allows immediate and adequate intervention in the event of limit value infringements. The TM 20 reliably and quickly provides the measured values - for control, regulation and the temperature measurement of objects which may be small, big, moving or stationary.

Three different versions are available to match with individual applications which differ in the temperature range, the ambient temperature and the respective position. With regard to the required temperature range, the TM 20 is equipped with a Thermopile, a PbSe, PbS or a Ge sensing element.

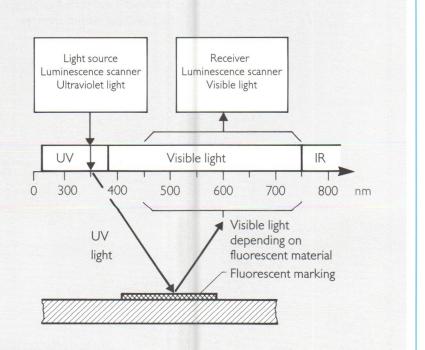


Fig. 4. Luminescence scanner



WT 18 Photoelectric Proximity Switch used for the control of lid catches in margarine packaging

	Model							
	Scanning range	m	5		12	25	50	100
Through-beam Photoelectric	WS 5/WE 5	1.5						
Photoelectric	WS 6/WE 6		5					
Switches	WS 9/WE 9		5					
	WS/WE 18				12			
	WS 27/WE 27					25		
	WS 36/WE 36						50	
	WS 45/WE 45							100
	WS/WE12				10			
	SP 10/EP 10	2						
	WS/WE 260				20			
	VS/VE 180				15			
	WSU 26/WEU 26					30	60	
	Scanning range	m	1		2	3	4	8
Photoelectric	WL 6	<b>m</b>			2	3	4	0
Reflex Switches	WL9	0.1			2			
	WL 18				2	4.00	4	
	WL 27						4	
	WL 36	0,1						10
	WL 45	0,1						45
	WL 12					3		73
	LP 10	0,65				3		
	WL 260	0.01					5	
	VL 180	0.05				3	3	
	WL 25 Ex i	0.03				3		25
					400	200		
Photoelectric	Scanning distance	mm	20	100	150	300	800	2000
Proximity Switches	WT 5			100		200		
	WT 6	40	20			300		
	WT 9	10 20	20		E0 +c 150			
	WT 18	20			50 to 150	100+- 200		
	WT 27		30			100 to 300		
	WT 36		40		200		200 to 800	
	WT 45		100		200		400 to	
	WT 32	15 20	100			1004 - 200		2000
	WT 30	15 30	25	100		100 to 300		
	WT 12 VGA	20	35	100				
	WT 12 HGA WT 12	20	80		130	400		
	WT 12 (contrastsc.)		13.5			400		
	WT 260		13.3				800	
	VT 180					400	800	
	WT 25 Ex i	10				700	1000	
	RP 1-11 <sup>5</sup> )	9.5					1000	
	Scanning range	mm	25		50	100	150	200
Photoelectric	WLL 5	711111	23	40	30	100	150	200
Fiber-optic Switches	WLL 6			,0			150	
	WLL 10		_				200	

# Selection Table Through-beam Photoelectric Switches Photoelectric Reflex Switches Photoelectric Proximity Switches Photoelectric Fiber-optic Switches

_	-	pm	en		>	Supply voltag	e	Out	put		Coni	nection		Pa
Polariz. filte	Test input	=			delay							Ter-	Cable	
Polar	Test	VMA	FS2)	BS3)	Time	DC	AC/DC	PNP	NPN	Relay	Plug	minals		
						12 += 24 \/								L.
				-		12 to 24 V		•	•	-	-	-	•	3
	-	_				12 to 24 V	<u> </u>	0	•	-	1 -		•	4
	•	=		_	-	10 to 30 V	<u> </u>	•	•	-	-		•	1
D.	•	_	P	-	_	10 to 30 V	-	•	0		•	-	•	(
n			in a		0	10 to 30 V	24 to 240 V	•		0	•		-	7
red	9	9	edi	-	•	10 to 30 V	24 to 240 V	•	•	•	•	•	-	
Not required		•	Not required			10 to 60 V	24 to 240 V	0	•	•	•	•	-	8
Z	•		ž		-	10 to 30 V	-	•	•	-	•	-	•	1(
		-				10 to 30 V	3 V/1.5 V (lamp)	0	•	-	-		•	11
	•	•		_	•	10 to 30 V	-12 to 240 V/~24 to 240 V	•	•	•	-	•	-	12
	•	-		_	=	10 to 30 V	~20 to 264 V	•	•		•		•	13
		-		-	-		~42/48, ~110/120, ~220/240			•	•	•		15
	_	_				12 to 24 V		•						
•	_	_		_		10 to 30 V	_	. 0		_	_		•	
0	•					10 to 30 V	_		•		<u> </u>	_	•	6
0	•	_				10 to 30 V	24 to 240 V		•	_		_	•	-
•	•	•	De.	- 1	-	10 to 30 V	24 to 240 V			•	•	•		8
•	•	•	ot required			10 to 60 V	24 to 240 V		0	•	-			8
•	•	_	Ē	_	-	10 to 30 V	-	0	0	_	•		•	10
		_	Not			10 to 30 V	3 V/1.5 V (lamp)		•		-	- 7	•	12
•	•				-	10 to 30 V	-12 to 240 V/~24 to 240 V		•	•	_	•		13
	_			_	_	10 to 30 V	~20 to 264 V		•	_	•		•	13
-	-	-		-	-	5 to 13,5 V	-	(4)	(4)		-	•	-	20
	-	-	-	-	-	12 to 24 V		•	•	-	-		•	3
	-	-	-	-	-	12 to 24 V		•	•		-		•	4
	-	-	-	-	-	10 to 30 V		0	•	-	-	-=	•	5
	-	-	-	•	-	10 to 30 V		•	•		•	-	•	6
	•	-	-	•	•	10 to 30 V	24 to 240 V		•	-	•		•	7
	•	-	-	•	•	10 to 30 V	24 to 240 V	•	•	•	•	•	-	8
0	•	-	-	•	•	10 to 60 V	24 to 240 V	•	•	•	-	•		9
	•	•	-	-	•	10 to 30 V	24 to 240 V	•	•	•	•	•		9
Not required	-	-	-	•	•	10 to 30 V		0	•	-	-	•	•	9
10	-	-	•	-1	-	10 to 30 V		•	•	-	•	-	•	10
-	-	-	-	•	-	10 to 30 V		•	•	-	•	-	•	11
	-	-	-	-	-	10 to 30 V		•	•		•	_	•	11
	-	-	-	-	-	10 to 30 V		•	•		•	-		11
	•	•	-	-	•	10 to 30 V	-12 to 240 V/~24 to 240 V	•	•	•	-	•		13
	-	-	-	-	-	10 to 30 V	~20 to 264 V	•	•	-	•		•	14
	-	-	-	-	-	5 to 15,5 V		<b>4</b> )	<b>4</b> )		-	•		20
	-	-	-	-	- [	10 to 30 V	3 V (lamp)		•				•	20
	_	_	i.	-	-	12 to 24 V		•	•				•	3
-	_	_		-	-	12 to 24 V		•	0		_	-	•	4
				_		10 to 30 V					_	_		12

<sup>4)</sup> Status-dependent control curren

# Selection Table Contrast Scanners, Luminescence Scanners Distance Measuring Devices Temperature Measuring Instruments

Model	Scanning distance mm				Power Supply		Output					Type of Connection		Page
		Time delay	Autom. sensitivity adjustment	Blanking	DC	AC/DC	PNP	NPN	Relay	В	Analog	Plug connector	Cable	
NT 6	9, 18	•	-	<u>-</u>	10 to 30 V	-	•	•	-	•	•	-	•	164
NTL 6	0,5 to 5 (Scanning distance) 0 to 60 (Scanning range)	•	_	-	10 to 30 V	-	-	-	-	•	•	•	•	166
NTA 6	9, 12.5, 18	.  -	•	•	10 to 30 V	-	-	-	-	•	-	•	•	170
NT 8	9, 18	-	-	-	10 to 30 V	4.5 V	•	•	-	-	_	•	•	172
LUT1-4	8 to 300 8 to 14 (with fiber-optic cable)	-	-	-	18 to 30 V	-	•	-	-	-	•	•	-	186
LUT1-5	8 to 125 8 to 14 (with fiber-optic cable)	•	-	_	18 to 30 V	-	•	•	-	-	•	•	-	188

<b>DME 2000</b>	Scanning distance/Scanning range	Supply voltage	Page
Mod. 1	100 to 2000 mm	DC 18 to 30 V	219
Mod. 2	0.1 to 130 m	DC 18 to 30 V	219

Model	Temperature range	Min. size of object	Distance	Supply- Voltage	Cable	Page
TM 20-1	0 to 500°C/150 to 500°C	Ø 4 mm/32 mm, 2 mm/20 mm	50 mm/500 mm 50 mm/500 mm	DC 12 to 24 V	•	222
TM 20-2	0 to 500°C	4 mm/32 mm	50 mm/500 mm	DC 12 to 24 V	•	224
TM 20-3	400 to 800°C/600 to 1200°C/ 1000 to 2000°C	12 mm	200 mm	DC 12 to 24 V	•	226

# SICK SENSICK Sensors

# What SENSICK has to offer

	Page 15	Testing	
	Page 16	Networking capabilit	y
Pa	age 17	Timing elements	
Page	18	Insensitivity to ambie light through interference suppres	
Page 19	9	Short-circuit protect	ion
Page 20		Enclosure rating IP 6	1
Page 21		Maintenance alarm	
Page 22		Alignment aid	
Page 23		No false triggering on power-up	
Page 24		Explosion protection	1
Page 25		Polarizing filter on photoelectric reflex switches	
Page 26		Foreground suppress photoelectric proxin switches	sion on nity
Page 27		Background suppres on photoelectric proximity switches	sion

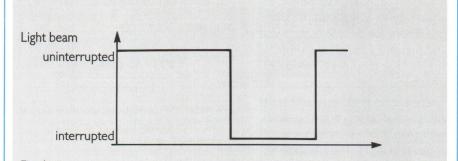
## Testing

Tests are carried out periodically – in most cases prior to major runs – to check the operational readiness of a control system. The test can take the form of switching the supply voltage of the optical sensor on and off.

This kind of test has two drawbacks, however: in the case of optical/ electronic devices, the optical operating range is not monitored; with devices equipped with power-up false-triggering suppression, the suppression period has to be taken into account. It is basically true that electronic components for overvoltage protection, polarity-reversal protection and power-up false-triggering suppression are heavily loaded in this type of testing.

Modern photoelectric switches and proximity switches have a separate test input. In such devices the light source is switched on and off almost without power. Photoelectric switches can be tested when the beam is uninterrupted (no obstacle in the path of the beam), and photoelectric proximity switches when there is an object with a defined reflecting property in the range of visibility of the proximity switch (Figs. 1 to 4). By switching the light source, it is possible to monitor the entire optical system and the complete electronics and leads, including the test lead. Testing is possible on the direct-voltage versions of the devices: WL 18, WL 27, WL 36, WL 45, WT 27, WT 36, WT 45, WS/WE 9, WS/WE 12, WS/WE 18, WS/WE 27, WS/WE 36 and WS/WE 45.

If no testing is required, the test input can also be used to interconnect devices. Series and parallel connections can be executed in the form of logic operations (see Networking Capability).



The optical signal at photoelectric reflex or proximity switch

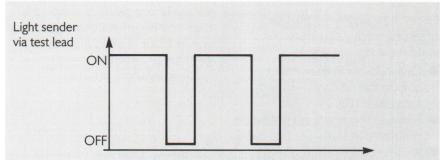


Fig. 2. Switching function of light sender during test (disconnection)

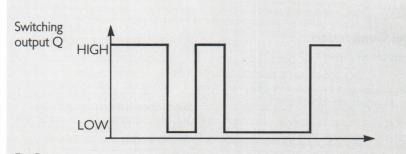


Fig. 3.

Switching behaviour of transistor output Q when testing: uninterrupted and interrupted beam

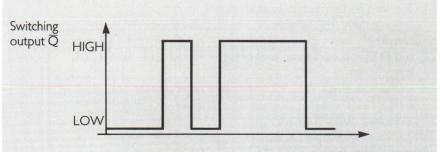


Fig. 4. The inverse switching behaviour of transistor outut  $\overline{\mathbb{Q}}$  for testing: uninterrupted beam and interrupted beam

# **Networking Capability**

In certain applications it can be an advantage to achieve simple logic operations for photoelectric switches and proximity switches without special logic modules ("wired OR" principle).

There are no problems with series and parallel connection of devices with (electrically isolated) relay contacts (Fig. 1). The situation is rather more complicated in the case of direct-voltage devices with transistor outputs in NPN, PNP and B configurations.

Electrical ground-rules must be observed when gating electronic switching outputs:

- Only NPN or PNP switching outputs can be combined with each other (Fig. 2).
- B switching outputs can neither be connected in series nor in parallel.
- Because of the relatively high making current, the supply voltage of modulated-light devices can only be conditionally switched by short-circuit protected switching outputs.

### **Parallel Connection**

The number of direct-voltage-supply photoelectric switches and proximity switches which can be connected in parallel is governed by the following parameters:

- a) Supply voltage (e.g. 30 V)
- b) Internal pull-up and pull-down resistances (approx. 10 k $\Omega$ )
- c) Max. permissible switching current of switching output Q (e.g. 200 mA)
- d) Current consumption of load at device output (e.g. relay with 50 mA)
- (a) and (b) produce a basic load of

$$\frac{30 \text{ V}}{10 \text{ k}\Omega} = 3 \text{ mA}$$

The switching output of each individual device should be capable of switching the basic load (3 mA) as well as the relay (e.g. 50 mA). The max. number of transistor 16 outputs which can be connected in

parallel can be calculated from:

$$SUM = \frac{I_{Qmax} - I_{Rel}}{I_{Pull}}$$
$$= \frac{200 - 50 \text{ (mA)}}{3 \text{ (mA)}} = 50$$

Under the conditions assumed, up to 50 devices can be connected in parallel (Fig. 3).

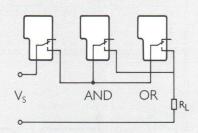
### **Series Connection**

When photoelectric switches are connected in series, the supply voltage of one switch is switched by the switching output of the preceding switch. Modern switching outputs are generally provided with very quick-acting short-circuit

protection or with an overload fuse - with a response threshold between 150 and 250 mA. Modulated-light devices, on the other hand, require a relatively high making current: of the order of 500 mA to 2000 mA for a duration of a few milliseconds. Switching the supply voltage is consequently impossible.

### **Devices with Test Input**

The operational readiness of a photoelectric switch can be switched via the test input. If the test input of one switch is switched by the transistor output of the preceding switch, a series connection is hereby produced (Fig. 4).



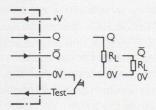


Fig. 1. Problem-free series and parallel connection of relay-type photoelectric switches

Fig. 2. Connection diagram of PNP device

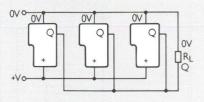


Fig. 3. Parallel connection of three PNP devices

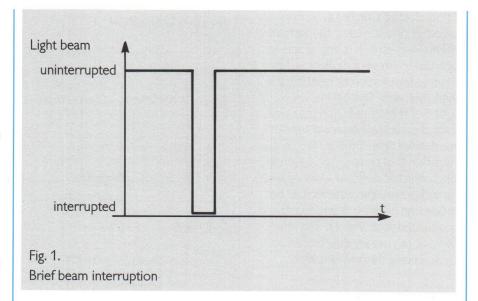
Fig. 4. Series connection in conjunction with test input

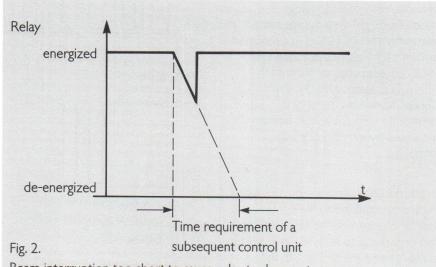
# **Timing Elements**

The switching outputs of optical/ electronic devices directly follow the optical conditions - with the appropriate system-determined time delays.

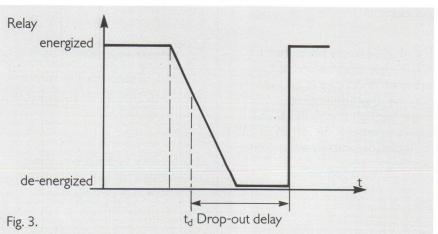
Because of the high speed of the optical principle, false information can be produced by brief interruption of the beam in the case of throughbeam or reflex photoelectric switches, as well as by brief detection of objects by photoelectric proximity switches. A series-connected relay may not be given sufficient time to switch, or the electronics may require a certain pulse duration to increase interference immunity (Fig. 2).

To permit individual matching in this connection, devices with timing elements are available: from devices size W 27 onwards they can also have programmable time delays. These time delays can be selectively switched to ON-delay or OFF- delay (Fig. 3) and, according to the version, can be finely adjusted from 0.015 to 0.35 s or from 0.5 to 12 s.





Beam interruption too short to cause relay to drop out.



A photoelectric switch with timing element and programmable relay energizing and de-energizing delay enables the relay contacts to be reliably switched, even for short beam interruptions.

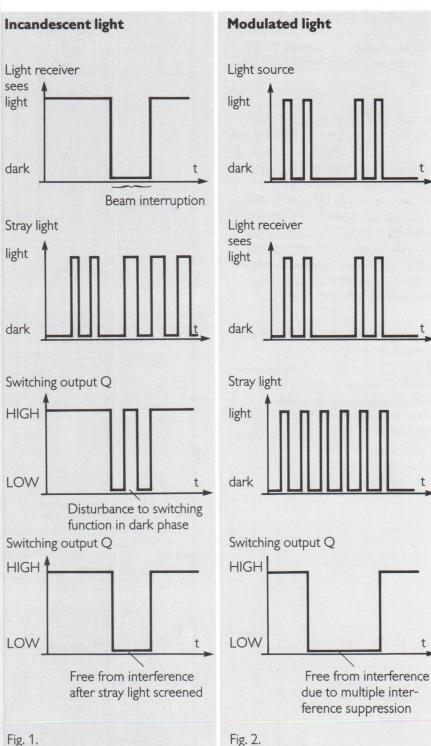
# Insensitivity to Ambient Light through Interference Suppression

Photoelectric switches and proximity switches operate using the light they themselves emit. It is impossible in practice to prevent daylight or light from external sources reaching the light receivers. This light is "ambient" light. Sources of radiation may emit incandescent (continuous) light or modulated light. If the power of the radiation is of an appropriate order, photoelectric switches working with incandescent-light systems may be influenced both by incandescent and modulated light (Fig. 1). The interference can usually only be reduced by screening the ambient light.

Compared with incandescent-light systems, devices employing modulated-light systems are more secure by several factors in relation to ambient light, especially to daylight, incandescent lamps or common fluorescent lamps (Fig. 2). With SENSICK devices, security in relation to ambient light is further increased by interference suppression.

In interference suppression, the light receiver is coupled to the light-sender electronics: the receiver is in fact only ready to receive while a light pulse is being transmitted. In the intervals between pulses, the receiver is "blanked", i.e. it ignores all optical and electronic interference pulses.

The method has its limits: multiple interference suppression has therefore been developed to counter extreme stray light in a high-frequency, high-energy form. This applies to series 9, 18, 27, 36 and 45 photoelectric switches and proximity switches.



Photoelectric switches employing incandescent-light systems react to ambient-light pulses when light receiver sees "dark".

With modulated-light switches equipped with interference suppression, the light receiver is also switched off in the dark phase of the light source. Interference is therefore effectively suppressed.

# **Short-circuit protection**

Whereas photoelectric switches with relay outputs can work - according to the loading capacity of the contacts - strong currents, the capacity of electronic outputs is limited.

The outputs of SENSICK photoelectric switches are most efficiently short-circuit protected: While operating, the output current is continuously measured. If the current exceeds the maximum value the integrated electronics checks the state of the output. The latter is activated for a short instant to check if the overload still exists.

If the output is in normal condition the photoelectric switch will return immediately into the normal operating mode.

Due to this most effective electronic protection, it is not possible to connect the output signal to the input of another photoelectric switch.

Electronic devices require a very strong current for the moment of switching on. This current is much stronger than the nominal current consumption indicated in the data sheets. The electronic short-circuit protection prevents this currents from damaging or overloading the output transistors.

# **Enclosure rating**

		• •	***						
			150			A R			
Protection against	No protection	Tricklin vertical	g water   inclined	spray- water	splash water	hose	flooding	dipping	imme
IEC 529 DIN 40050	IP0	IP1	IP2	IP3	IP4	IP5	IP6	IP7	IP8
IP O	IP 00							,	
No protection IP 1									
E/	IP 10	IP 11	IP 12						
Max. size of the foreign body: 50 mm									
IP 2	IP 20	IP 21	IP 22	IP 23					
Max. size of the foreign body: 12 mm									
IP 3	IP 30	IP 31	IP 32	IP 33	IP 34				
Max. size of the foreign body: 2.5 mm									
IP4	IP 40	IP 41	IP 42	IP 43	IP 44				
Max. size of the foreign	11 40	111	11 72	П ТЭ	" 11				
body: 1 mm									
and the same of th	IP 50			IP 53	IP 54	IP 55	IP 56		
Dust									
IP 6	IP 60					IP 65	IP 66	IP 67	

## **Contamination Control**

The main criterion with photoelectric switches is the scanning distance.

If the environment is excessively dusty, after a long period of exposure, this value may no longer be sufficient: - dust settles on the photoelectric switch and on the reflector (Fig. 1). If the reduction in light transmission due to dirt accumulation on any (boundary) surface is a uniform 20 % (visually hardly perceptible, without direct comparison), the received light signal strength will, because of the double penetration of the dust layer, represent only about 40 % of the light available in a clean condition. The complete safety margin is thereby used up and the value falls below the switching threshold.

In order to provide the user with warning of imminent breakdown of the photoelectric-switch system, SENSICK devices are equipped with a contamination control. If the received light signal strength is less than 50 % above the switching threshold (factor of 1.5), the signal strength indicator starts to blink at 5 Hz (Fig. 2).

Devices such as WL 36, WL 45, WL 260, WS/WE 27, WS/WE 36 and WS/ WE 45 additionally offer a signalling output which is independent of the switching outputs. Remote monitoring is thereby also a possibility.

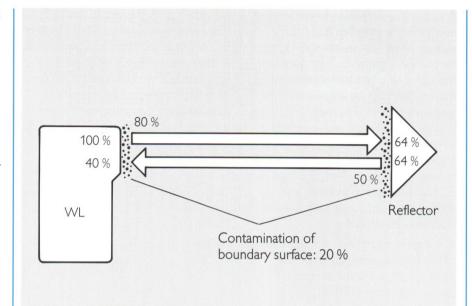


Fig. 1. Even relatively little contamination on the optics can completely use up the safety margin.

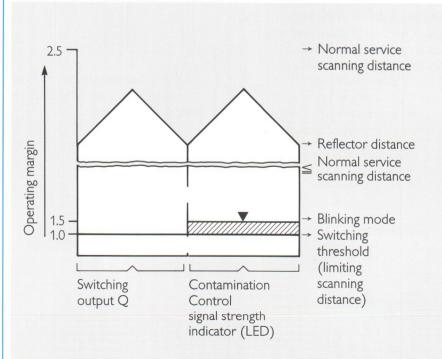


Fig. 2. While the switching operation still exhibits a defined switching behaviour, the blinking mode signals entry into the safety margin (with an operating-margin factor of less than 1.5).

# Alignment aid

Among others, reliable functioning of photoelectric switches and photoelectric proximity switches depends on correct alignment. Therefore with through-beam photoelectric switches, the sender must be aligned with the receiver element. Photoelectric reflex switches are aligned with a reflector. When using a photoelectric proximity switch, the object must be positioned in the reception range. SICK photoelectric switches are aligned by means of an optical or an electronic alignment aid.

The alignment sight on the upper side of the photoelectric switch is the most simple aid and it is used for coarse adjustment. Then, precise alignment is carried out by electronic means. A LED signals correct adjustment. Following coarse alignment, the photoelectric switch is moved in such a way (the light path being uninterrupted) that the LED is permanently lit. Turning the photoelectric switch helps to find out the range of correct alignment since the LED starts blinking as soon as this area has been left. If the photoelectric switch is moved further away from this area the LED switches off. Accurate alignment is just between the two blinking positions. Photoelectric proximity switches are adjusted in the same way. An object, however, is required for alignment.

A further aid is the visible red light. The red sender light which is emitted by photoelectric proximity switches is focussed at an object whereas the red light emitted by photoelectric reflex switches is reflected by the reflector. An alignment sight, however, is not adequate aid for the coarse alignment of photoelectric switches with great

scanning ranges, e. g. the WS/WE 45 with a 100-m scanning range. Hence, these models are equipped with a special alignment optics similar to that of cameras. This optics allows relatively accurate alignment even at greater distances.

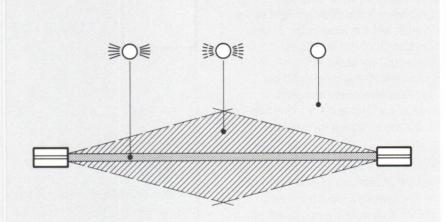
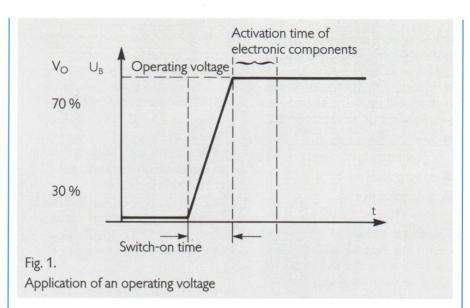
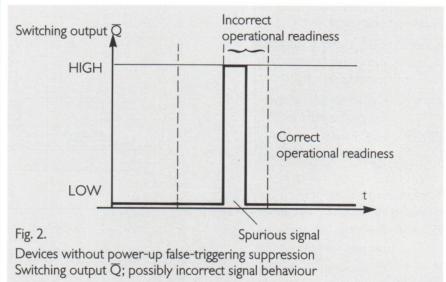


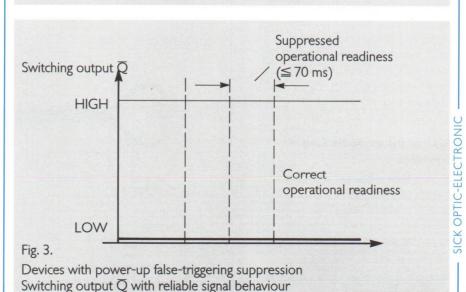
Fig. 1. A permanently lit indicator signals correct alignment. Slight misalignment is signalled by blinking, the indicator switches off with total misalignment.

# No False Triggering on Power-up

Switch-on of an electronic device should not be equated with instantaneous normal function (Fig. 1). During the switch-on process, the electronics pass through certain operational states which may, at least briefly, be caused to operate abnormally by a spurious pulse. In many devices, however, this is absolutely necessary. During the switch-on process, no false statement must be issued at the output (Fig. 2). The phrase describing the internal arrangement which prevents this is "No false triggering on power-up". It forces release of the output and consequently acceptance of the optical input conditions only after normal operation of the device. Functions of a plant control system can therefore never be initiated at the wrong time, and time controls encountered in practice are not improperly started. The process takes time: up to 70 ms (Fig. 3), which must be taken into account when test-switching the supply voltage.







# **Explosion Protection**

Wherever combustible substances and liquids are produced, transported, processed and stored, an explosive atmosphere can be produced, constituting a danger to humans and property. The essential prerequisites for an explosion are:

- combustible substances (gas; dust; vapour; mist)
- oxygen (air)
- ignition source (sparks; temperature).

To protect humans and property, design specifications exist for devices used in areas prone to explosions. Areas with explosive atmospheres (due to gases, vapours or mists) are divided into "zones" according to the likelihood of an explosion (Fig. 1):

- Zone 0 Explosive atmosphere present continuously or for long periods
- Zone 1 Explosive atmosphere occasionally present
- Zone 2 Explosive atmosphere rarely or briefly present

The following zones apply to explosive atmospheres due to dust:

- Zone 10 Explosive atmosphere present for long periods
- Zone 11 Explosive atmosphere occasionally present

In zones 0, 1, 10 and 11, only equipment (including photoelectric switches and proximity switches) having a Certificate of Conformity may be used (e.g. WL 25-Ex i for zones 1 and 11).

# Use of Fiber-optic Cable Systems

When fiber-optic cable systems (WLL 6; WLL 10; NTL 6; LUT 1-5 with fiber-optic cable) are used in areas prone to explosions, the following points must be borne in mind (Fig. 2):

 exclusively fiber-optic cables in the area prone to explosions

- installation of associated opticelectronic modules outside the area prone to explosions
- sealing of fiber-optic cable bushing in accordance with DIN/ VDE 57165, section 5.6.2 (Fig. 2).

If the above installation recommendations are followed, the fiber-optic cable systems are suitable for use in all explosion-protection zones (0, 1, 2, 10 and 11).

In a class-2 zone, devices without a Certificate of Conformity can also be used, e.g. series 12, 18, 27, 36 and 45 from the SENSICK series, or NT 6

and NTL 6 registration control scanners. When the devices are installed using a plug, a plate warning "Do not remove/insert plug under load" must be fitted near the plugs. In addition, the leads employed should have a minimum cross-section of 0.5 mm<sup>2</sup> (see DIN/ VDE 57165). Selection according to temperature classes (T 1 to T 6) should also take place. Devices in the SENSICK P series, NT 6 and NTL 6 can be used for a max, of T 4.

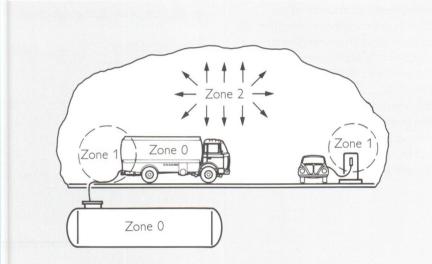
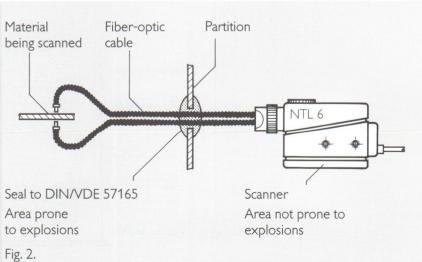


Fig. 1.

Different areas with an explosive atmosphere



Only the fiber-optic cables are in the area prone to explosions. It is suitable for protective zones 0, 1, 2, 10 and 11.

# **Polarizing Filters**

Photoelectric reflex switches work in conjunction with special retro-reflectors. The devices are designed to react only to these reflectors and to detect them as "light". If the light beam between reflex switch and reflector is interrupted by an obstacle, the switch should signal "dark". The obstacles may be objects with very varied surfaces, even mirror-bright special steel or aluminium, or tin containers and metal foils.

A photoelectric switch cannot normally differentiate between the reflected light from a reflective surface and the reflection from a reflector. This leads to maloperations. The situation can be alleviated by fitting a polarizing filter.

### **Function of a Polarizing Filter**

The light emitted from ordinary light sources, e.g. incandescent lamps and LEDs, oscillates in an arbitrary plane. This light is guided by a polarizing filter, a "striped" filter. Beyond the filter, the light oscillates only in the direction of the stripes, i.e. horizontally, for example (Fig. 1). With an uninterrupted beam, the horizontally oscillating light strikes the reflector. The reflectors recommended by SICK behave in an optically active manner, i.e. they rotate the polarization axis through 90°. The beam is no longer able to return through the polarizing filter used at the exit.

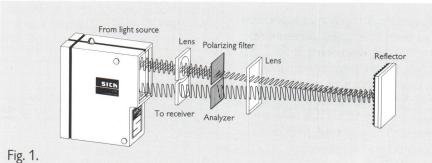
A further polarizing filter is arranged in front of the receiver part of the photoelectric switch. This filter is turned through 90° in relation to the light-source filter – corresponding to the reflected beam.

Consequently, no horizontally polarized light can reach the receiver, such as is reflected by a simplereflection "normal" glossy material. Any material which does not rotate the polarization plane is detected as an obstacle (Fig. 2).

### **Limits of Mirror Reliability**

Photoelectric switches in the SENSICK series are not disturbed by surface reflections. Problems are experienced with optically transparent materials, however, such as Perspex (Plexiglas/Lucite) lids, laminated foil or foil transitions. It is not the surface gloss that causes trouble, but the reverse side of the transparent material. By virtue of their molecular structure, Perspex (polymethyl methacrylate resin) and other optically clear foils exhibit the property of polarization-plane rotation: the polarized light from the source, when it penetrates the foil medium, may be turned through 45°

compared with its original direction of oscillation. Reflected by the reverse side of the material, it passes through the material with a further 45° rotation. The total rotation is therefore 90° or a multiple of 90°. In this case, the photoelectric switch may respond in an unacceptable manner (Fig. 3). The effect of the disturbance is relatively small, however. It can be eliminated by reducing the system sensitivity slightly (turning the sensitivity controller). A further improvement can be achieved by changing the scanning angle of the photoelectric switch in relation to the surface of the object.



Mode of operation of polarizing filter

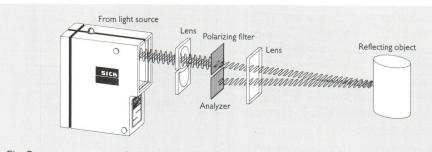
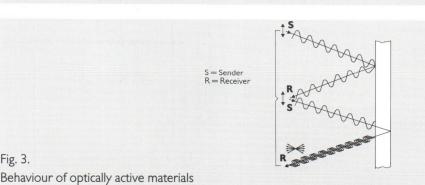


Fig. 2.
Reflection from object



SICK OPTIC-ELECTRONIC

# **Foreground suppression**

When using a photoelectric proximity switch, foreground suppression may be necessary in some cases. Fig. 1 shows the assembly. There is one element for the distant range and two for the short range.

The photoelectric proximity switch has become a widespread measuring instrument. The different versions, e. g. as an energetic proximity switch or with background suppression are used for numerous purposes. But all systems known so far depend on the surface quality of the object: big differences in the surface reflectance may lead to faulty measurement and even make the use of proximity switches doubtful.

Therefore, foreground suppression has been developed to ensure safe and reliable functioning of the photoelectric proximity switches even in problematic applications for example. A comparatively flat object with an irregular surface reflectance needs to be detected, positioned or counted on a conveyor.

Due to its scanning method, a photoelectric proximity switch would not be capable of detecting the object on the conveyor. The photoelectric proximity switch with background suppression is not capable of making a distinction between the background, i. e. the conveyor, and the object; the irregular surface reflectance would lead to faulty measurement.

A photoelectric proximity switch with foreground suppression is the solution to this problem. The conveyor, for example, is used as a reflecting material. Contrary to normal functioning, the photoelectric proximity switch detects an interruption of the light beam produced by the conveyed object and operation is unaffected by the reflective properties of the material.

### **Functioning**

Photoelectric proximity switches work with visible light thus ensuring good visibility of the light spot on the material as well as accurate adjustment. Highest switching accuracy is obtained in the focus area of the beam of sender light. For adjustment, the scanning distance is reduced until the instrument switches. The signal strength indicator is lit. If the object, which is to be detected, is moved in the light path, the signal strength indicator goes off.

### **System Structure**

The photoelectric proximity switch with foreground suppression works with a focussed beam of sender light (smallest diameter of light spot at a scanning distance of approx. 60 mm) and is equipped with a pivoting

mirror for the receiving element. This deflecting mirror allows adaptation of the proximity switch to the scanning distance without changing the sensitivity of the system. Proximity switches with foreground suppression provide high switching accuracy since there is a greater distance between the sender and the receiver element.

### **Advantages**

- Visible red light
- Insensitive to heavily contrasting objects
- High switching accuracy in the focus (2mm with a scanning distance of 60 mm)
- Big adjustment range (35 to 100 mm)

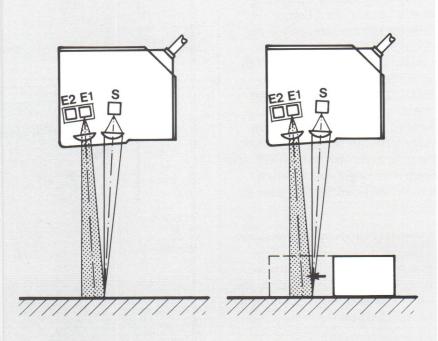


Fig. 1.

The proximity switch signals interruption of the light beam by an object

# Background Suppression on Photoelectric Proximity Switches

Unlike photoelectric switches, photoelectric proximity switches signal the presence of an object. The object reflects the beam, instead of interrupting it as it does in the case of a photoelectric switch. The reflecting property of the surface of the object ought to play a subsidiary role. The proximity switch should be capable of detecting a dark object, such as black paper, as well as it does a bright object, such as white paper.

In simple systems ("energetic" proximity switches), the scanning distance is a function of the reflectance of the material being scanned and of the sensitivity of the system. In this case, a dark object implies a short scanning distance; a light object a long scanning distance. With "energetically working" proximity switches it is consequently difficult for a standard proximity switch to detect dark objects properly against a light background. Using a proximity switch equipped with background suppression, on the other hand, it is possible to differentiate reliably between an object being detected and a light background, with an extremely short gap between them.

In their proximity switches equipped with background suppression, SICK combine Opto-electronics with Mechanics (Fig. 1). The light source transmits a beam via an optic. Any object present returns a proportion of the light, depending on its reflecting capacity. The reflected light strikes light receiver E 1 via an optical system. A second receiver E 2 receives a certain proportion of light from the background surface which is at a greater distance than the object. If the proportion of light received by light receiver E 1 is greater than that at E 2, the proximity switch signals the presence of an object in the scanning distance. If the reverse situation is observed, the proximity switch signals the absence of an object. By virtue of this differential procedure, photoelectric proximity

switches with background suppression work largely independently of the reflective properties of objects and background surfaces (Fig. 2).

On the WT 18, WT 27, WT 36, WT 45 and WT 12 the scanning distance can be adjusted using a

pivoting mirror (Fig. 1 – symbolic). Fig. 3 shows the function of background suppression on proximity switch WT 27. In this case, even an object with only 6 % reflectance can be reliably detected in front of a light background.

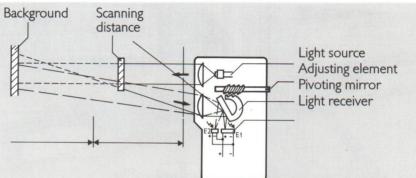


Fig. 1. Photoelectric proximity switch with mechanically adjustable mirror and light receivers E 1 und E 2. The larger receiver E 1 receives the "useful" light from the material being scanned, while E 2 receives the light from the more distant background.

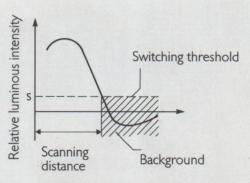


Fig. 2. The reception diagram shows the steepness of the curve caused by the difference formation between the output voltages of E 1 and E 2, and the resultant background suppression.

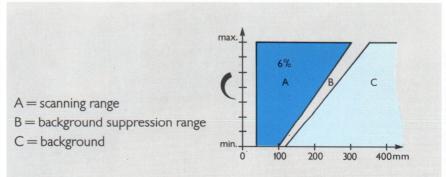
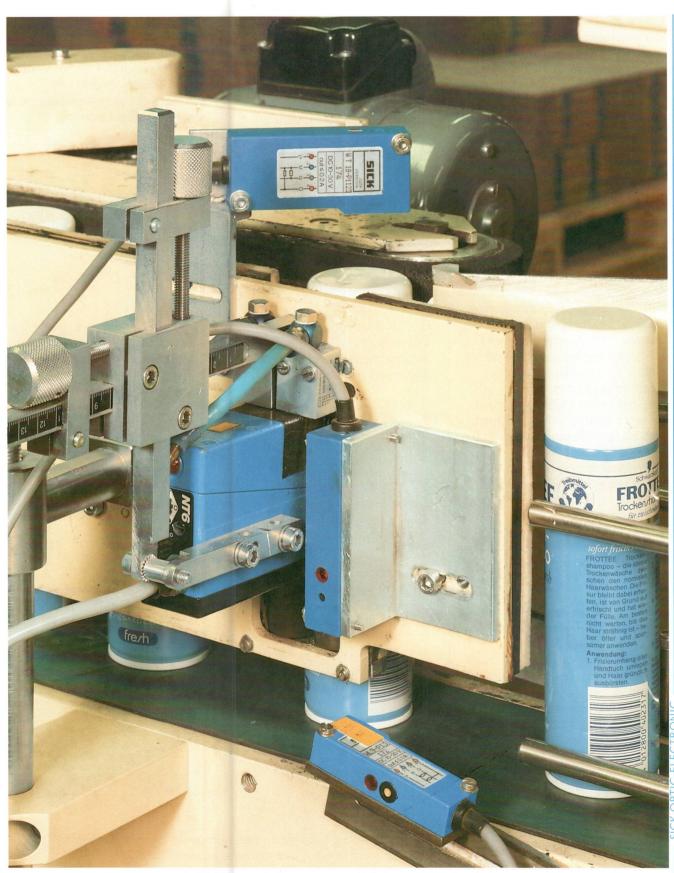
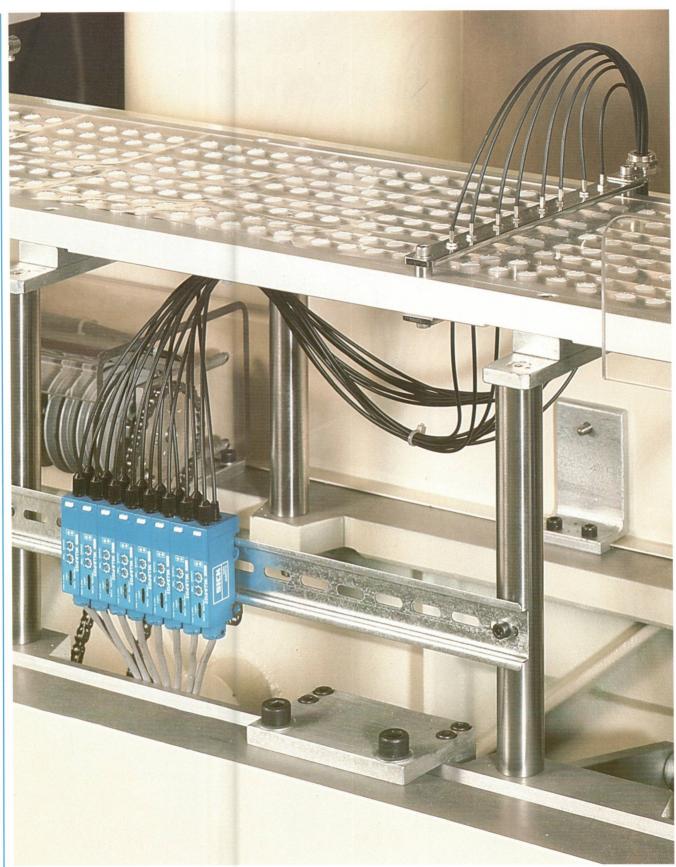


Fig. 3. Background suppression with photoelectric proximity switch WT 27. The case represented is an extreme case: a very dark object (6 % reflectance) in front of a light background.

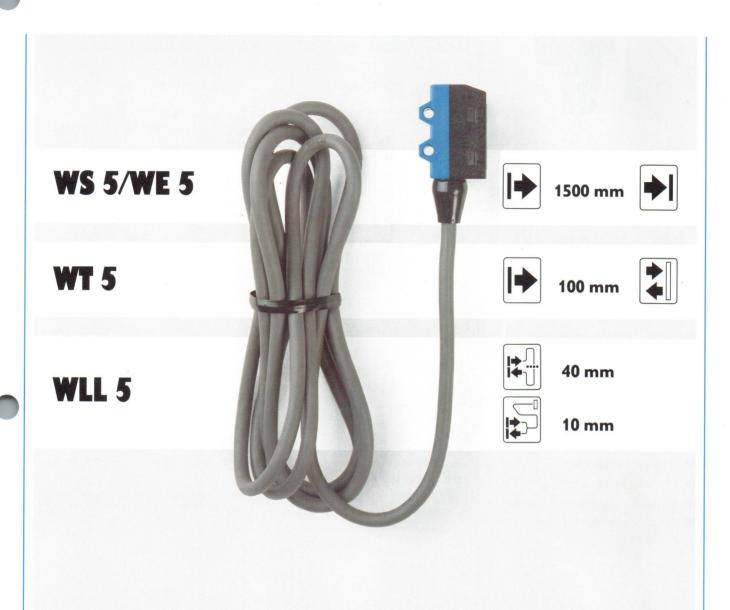


28 A NT 6 monitors the position, a WT 18 controls the caps and a WL 9 generates the clock-pulse

Through-beam Photoelectric Switches
Photoelectric Reflex Switches
Photoelectric Proximity Switches
Photoelectric Photoelectric Fiber-optic Switches



## **W** 5-Series **Sub-miniature Photoelectric Switches**



Sub-miniature photoelectric switches in plastic enclosures for restricted space applications.

Common features:

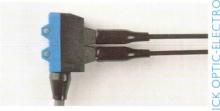
Sensitivity adjustment; LED signal strength indicator to show the switching output status or misalignment of the unit; supply voltage range from 12 to 24 VDC reverse-polarity protected; output current max. 100 mA; LIGHT- and DARKswitching; enclosure rating IP 65 (dusttight, waterproof); shock resistant to 50 g.

A complete range of sub-miniature photoelectric switches with a max.

volume of 5 cm<sup>3</sup> in through-beam, proximity, and fiber-optic models.



Adjustable sensitivity to meet harsh operating environments.



Fiber-optic models available (WLL 5) for locating the unit away from the scanning point.



### **Scanning Distance**

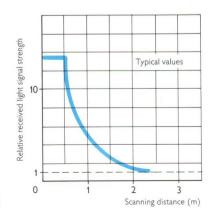


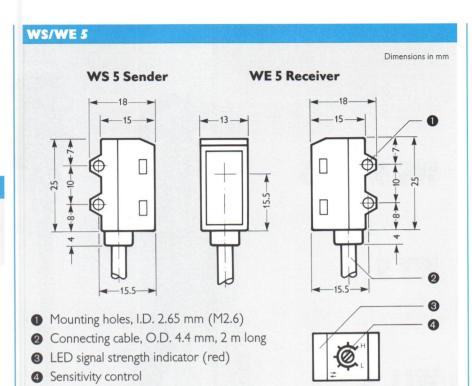
1500 mm



### **Features**

- Sub-miniature photoelectric switch
- LED signal strength indicator (red) to show misalignment
- Supply connections reversepolarity protected
- LIGHT- and DARK-switching
- Sensitivity adjustment
- Insensitive to ambient light
- No false triggering on power-up
- Glassfiber-reinforced plastic housing

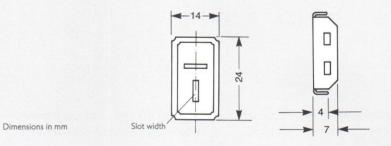




For mounting bracket (included), see page 20.

Slotted masks (see accessories) are available to detect small objects or to increase the operating precision.

The slotted mask should be mounted so that the top slot is perpendicular to the travelling direction of the object to be detected.



Slotted mask	Slotted mask placement	Scanning width	Scanning distance
None		7 mm	1.5 m
<b>BL 520</b> 2 mm slot Part No. 5304595*	on sender and receiver	2 mm	0.75 m
<b>BL 510</b> 1 mm slot Part No. 5304594*	on sender and receiver	1 mm	0.35 m
<b>BL 505</b> 0.5 mm slot Part No. 5304593*	on sender and receiver	0.5 mm	0.17 m

<sup>\*</sup> Package contains two slotted masks

# WS 5/WE 5 Through-beam Photoelectric Switch

WS/WE 5 Type	WS 5 Sender -D 132	WE 5 Receiver -N 132	-P 132				
Part No.	1)	6 007 412 <sup>1</sup> )	6 007 411 <sup>1</sup> )				
Scanning distance	1.5 m						
Supply voltage V <sub>S</sub>	12 to 24 VDC (±10%)						
Current consumption max.	30 mA						
Ripple max. <sup>2</sup> )	20%		9				
Light source	LED (infrared)						
Light receiver	-	LIGHT- and DARK-switching					
Sensitivity	_	adjustable	0				
Signal strength indicator	_	LED (red)					
Switching outputs Q and Q	-	NPN	PNP				
Output voltage max.		30 VDC					
Output current max.	-	100 mA					
Response time; switching frequency <sup>3</sup> )		max. 0.7 ms; max. 700	/s				
Enclosure rating	IP 65						
Circuit protection	supply connections rever	rse-polarity protected					
Ambient temperature	-25 to +55°C						
Connecting cable (oiltight)	$2 \times 0.2 \text{ mm}^2$ ; 2 m long	$5 \times 0.2 \text{ mm}^2$ ; 2 m long					
Weight	100 g						
Part No. includes sender and receiver     Must not exceed max. supply voltage	3) With light/dark time ratio of 1:1						
Accessories (included)	2 metal mounting bracke	ts					
	1 screwdriver						
	4 screws M2.6 with washers, nuts						
	1 connector (to connect the black wires)						

Truth Table for WE 5										
Switching mode	LIGHT-swi	tching (Q)	DARK-switching (Q							
Light received	yes	no	yes	no						
Signal strength indicator	<b>&gt;⊗</b> €	8	>⊗<	8						
Load R <sub>L</sub>	energized	de-energized	de-energized	energized						
NPN output	LOW	HIGH	HIGH	LOW						
PNP output	HIGH	LOW	LOW	HIGH						

WE5	-N1	132	-P132	
red +12 to 24 VD 24 VD 1873 Q 1073 Q 1074 Q	C C C C C C C C C C C C C C C C C C C	PRL OV		□ ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° °
ws s-D132 blk LIG	HT-switching D	ARK-switching	LIGHT-switch	ing DARK-switching

### Caution:

If you don't use the NPN output, be sure to connect the wire to 0 V (never to +V). If you don't use the PNP output, be sure to connect the wire to +V (never to 0 V). For synchronization connect the black wire of the receiver to the black wire of the sender using the connector provided.

red	gra	ora	blu	blk
red	gray	orange	blue	black
+V	Q	Q	0V	synchron- ization cable



### **Scanning Distance**



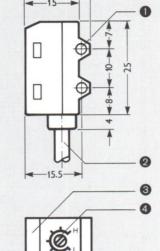
100 mm



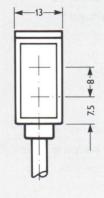
**WT 5** 

### **Features**

- Sub-miniature photoelectric switch
- LED signal strength indicator (red) to show misalignment
- Supply connections reversepolarity protected
- LIGHT- and DARK-switching
- Sensitivity adjustment
- Insensitive to ambient light
- No false triggering on power-up
- Glassfiber-reinforced plastic housing







- 1 Mounting holes, I.D. 2.65 mm (M2.6)
- Connecting cable O.D. 4.4 mm, 2 m long
- LED signal strength indicator (red)
- Sensitivity control

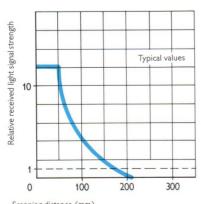
For mounting bracket (included), see page 38.

### Accessories

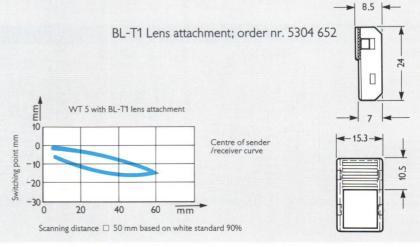
Scanning principle: Energetic, V system

### Application:

- Increased sensitivity with reduced scanning distance
   White standard 90%-t<sub>w</sub> 55 mm
   Grey Kodak 18%-t<sub>w</sub> 40 mm
- Suppression of irritating background reflexes with reduced scanning distance



Scanning distance (mm) (based on paper, white standard, to DIN 5033)



# **Photoelectric Proximity Switch**

WT	5 -N II2	-P II2	
Part No.	6007164	6007165	
Scanning distance	100 mm (based on paper, white standard, to DIN 5033)		
Supply voltage V <sub>S</sub>	12 to 24 VDC (±10%)		
Current consumption max.	30 mA		
Ripple max. <sup>1</sup> )	20%		
Light source	LED (infrared)		
Light receiver	LIGHT- and DARK-switching		
Sensitivity	adjustable		
Signal strength indicator	LED (red)		
Switching outputs Q and Q	NPN	PNP	
Output voltage max.	30 VDC		
Output current max.	100 mA		
Response time; switching frequency <sup>2</sup> )	max. 0.7 ms; max. 700 /s	S	
Enclosure rating	IP 65		
Circuit protection	supply connections reve	rse-polarity protected	
Ambient temperature	−25 to +55°C		
Connecting cable (oiltight)	$4 \times 0.2 \text{ mm}^2$ , 2 m long		
Weight	100g		
1) Must not exceed max. supply voltage	2) With light/dark time ratio of 1:1		
Accessories (included)	1 metal mounting bracke	et .	
	1 screwdriver		
	2 screws M2.6 with washers, nuts		

Switching mode	LIGHT-switching (Q)		DARK-switching $(\overline{Q})$	
Light received	yes	no	yes	no
Signal strength indicator	>⊗∈	8	<b>&gt;⊗</b> €	8
Load R <sub>L</sub>	energized	de-energized	de-energized	energized
NPN output	LOW	HIGH	HIGH	LOW
PNP output	HIGH	LOW	LOW	HIGH

# 

If you don't use the NPN output, be sure to connect the wire to 0 V (never to +V).

If you don't use the PNP output, be sure to connect the wire to +V (never to 0 V)

red	gra	ora	blu
red	gray	orange	blue
+V	Q	Q	OV





40 mm

For through-beam/applications

#### **Scanning Distance**



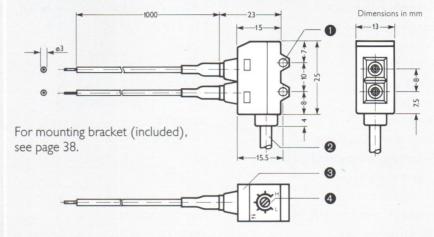
10 mm

For proximity applications

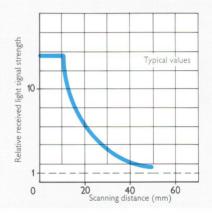
#### **Features**

- Sub-miniature photoelectric switch
- Fiber-optic cables in 1 or 2 tip configurations
- LED signal strength indicator (red) to show misalignment
- Supply connections reversepolarity protected
- LIGHT- and DARK-switching
- Sensitivity adjustment
- Insensitive to ambient light
- No false triggering on power-up
- Glassfiber-reinforced plastic housing

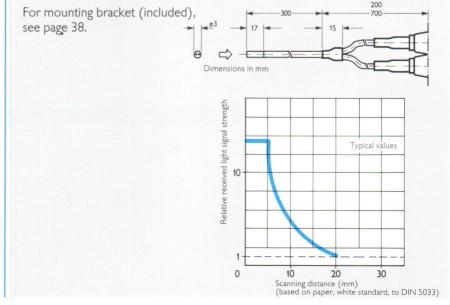
# WLL 5-N I 222/P I 222 (2 tip configuration, for through-beam applications)



- 1 Mounting holes, I.D. 2.65 mm (M2.6)
- 2 Connecting cable, O.D. 4.4 mm, 2 m long
- 3 LED signal strength indicator (red)
- 4 Sensitivity control



#### WLL 5-N III2/P III2, WLL 5-N II22/P II22 (I tip configuration, for proximity applications)



# WLL 5

# **Photoelectric Fiber-optic Switch**

WLL !	-N 1222	-N III2	-N1122	-P 1222	-P III2	-P 1122
With non-detachable fiber-optic cables						
Part No.	6007167	6007166	6007168	6007170	6007169	6007171
Length of the fiber-optic cable	1 m <sup>1</sup> )	0.5 m	1 m	1 m <sup>1</sup> )	0.5 m	1 m
Bending radius min.	25 mm					
Scanning distance	40 mm	10 mm <sup>2</sup> )		40 mm	10 mm <sup>2</sup> )	
Supply voltage V <sub>S</sub>	12 to 24 VE	OC (±10%)				
Current consumption max.	30 mA					
Ripple max. <sup>3</sup> )	20%					
Light source	LED (red)					
Light receiver	LIGHT- and	DARK-switc	hing			
Sensitivity	adjustable					
Signal strength indicator	LED (red)					
Switching outputs $Q$ and $\overline{Q}$	NPN			PNP		
Output voltage max.	30 VDC					
Output current max.	100 mA					
Response time; switching frequency <sup>4</sup> )	max. 0.7 ms	s; max. 700 /s				
Enclosure rating	IP 65					
Circuit protection	supply conr	nections rever	se-polarity pro	otected		
Ambient temperature	-25  to  +5.	5°C				
Connecting cable (oiltight)	$4 \times 0.2 \text{ mm}$	<sup>2</sup> , 2 m long				
Weight	100 g					
Using the cable cutter provided, you can cut the fiber-optic cable to the length you need	2) Based on pape 3) Must not exce	er, white standard, to ed max. supply volta	DIN 5033	4) With light/dar	k time ratio of 1:1	
Accessories (included)	1 metal mo	unting bracket				
	1 screwdriv	er				
	2 screws M	2.6 with wash	ers, nuts			
WLL 5-N/P 1222 only	2 snap-in fit	tings to conne	ct the fiber-op	otic cables		
	1 cable cutt	er (Part No. 5	304141)			

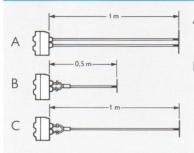
Truth Table				
Switching mode	LIGHT-sv	witching (Q)	DARK-swite	ching $(\overline{\mathbb{Q}})$
Light received	yes	no	yes	no
Signal strength indicator	<b>&gt;⊗</b> €	8	>⊗∈	8
Load R <sub>L</sub>	energized	de-energized	de-energized	energized
NPN output	LOW	HIGH	HIGH	LOW
PNP output	HIGH	LOW	LOW	HIGH

Conne	ction Dia	agram			
WLL 5	,	-N1222, -N	1112, -N1122	-P1222,	-P1112, -P1122
-	+12 to 24 VDC	i → ·	→ · · · · · · · · · · · · · · · · · · ·		**
-	gra Q	[	To	i 7°	
-	ora Q		Jō		¬Q N <sub>R</sub>
	blu ov	iov	ov	! 」₀	
	LIGHT-sv	vitching DARI	K-switching	LIGHT-switchin	g DARK-switching

If you don't use the NPN output, be sure to connect the wire to 0V (never to  $\pm$ V). If you don't use the PNP output, be sure to connect the wire to  $\pm$ V (never to 0V).

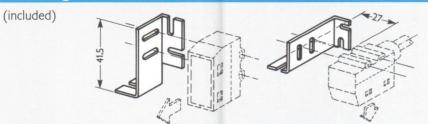
red	gra	ora	blu
red	gray	orange	blue
+V	Q	Q	0V

#### Fiber-optic Cable Configurations



- 2 tip configuration. Using the cable cutter provided, you can cut the fiber-optic cables to the length you need.
- B,C When the sender and receiver fibers are in a single tip (1 tip configuration), the fiber-optic cables cannot be shortened. Therefore, the application requirements to be met should be considered before ordering a WLL 5 model.

#### **Mounting Bracket**



#### **Sensitivity Adjustment**

The photoelectric switches are factory set to maximum sensitivity (H). If they are to detect transparent or translucent objects or if they are to be used where there is background interference, use the procedure described in the table below to adjust the sensitivity.

Step	Sensitivity control	Condition to be met	Signal strength indicator	Adjustment
1	<b>€</b>	Light beam uninterrupted.	ON	-
2	(€) <sup>H</sup>	Interrupt the light beam. (The signal strength indicator must go off.)	ON .	Turn the control toward "L" until the red LED goes off.
	A	Clear the	ON	Adjustment is complete
3		light beam.	OFF	Turn the control toward "H" until the red LED comes on.
4	<b>A</b> H	If necessary, repeat steps 2 and 3.		

Step	Sensitivity control	Condition to be met	Signal strength indicator	Adjustment
1	<b>€</b>	The object to be detected is present.	ON	-
2	( <b>®</b> <sup>H</sup>	The object to be detected is not present. (The signal strength ind. must go off.)	ON	Turn the control toward "L" until the red LED goes off.
	4	The object to be	ON	Adjustment is complete
3	(C)	detected is present.	OFF	Turn the control toward "H" until the red LED comes on.
4		If necessary, repeat steps 2 and 3.		

#### Fixing the Fiber-optic Cable End

Be sure the sleeve of the fiber-optic cable is not squeezed.

#### **General Notes**

The housings and lenses of the switches are resistant to alcohol, acid, and salt, but can be dissolved by ammonia solution, or benzene. Do not use the fiber-optic cables near organic solvents, such as those used in cast resin.

#### **Mounting Instructions**

WS/WE 5 and WLL 5 (2 tip configuration): Align the units by sight and mount them temporarily. Pan the sender and receiver units in the horizontal and vertical planes back and forth across each other. Tighten the screws completely at the point halfway between where the red LEDs come on and where they go off. WT 5 and WLL 5 (1 tip configuration): Align the unit by sight and tighten the mounting screws. Check to see that the signal strength indicator comes on when the object to be detected is present. If the LED does not come on even though the unit has been aligned properly, a sensitivity adjustment is required.

#### **Power Supply**

If a power supply unit is used, be sure to ground both the housing and the 0 V terminal.

#### **Connecting Cable**

Routing the cable along high voltage power lines may cause electrical interference. It is recommended that the connecting cable be run along a different route. When you are using 0.3 mm<sup>2</sup> wires, the power and output cables can be up to 100 m long.

#### Caution:

The black WS/WE 5 synchronization cable must not be lengthened.

# W 6-Series Miniature Photoelectric Switches





5 m



WL 6



2 m



WT 6



300 mm



WLL 6



150 mm



50 mm

Miniature photoelectric switches in glassfiber-reinforced plastic enclosures for restricted space applications.

Common features:

Coarse and fine sensitivity control.

LED status and signal strength indicators to show misalignment of the switch or the condition of light received (good, sufficient, insufficient, no light).

Insensitive to ambient light (sun: 30,000 lx, halogen: 10,000 lx). Response time max. 1 ms.

Supply voltage range from 12 to 24V. Output current max. 100 mA.

Choice of LIGHT- or DARKswitching. Enclosure rating IP 66 (dusttight, waterproof).



Coarse and fine sensitivity control

A complete range of miniature photoelectric switches with a max. volume of 13 cm<sup>3</sup> in through-beam, proximity and fiber-optic models.



Three LED status and signal strength indicators



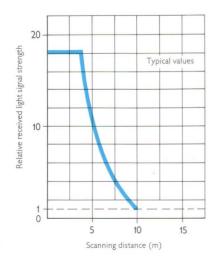


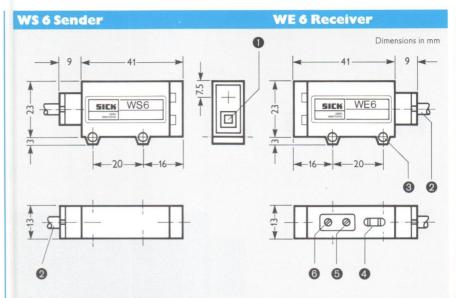
5 m



#### **Features**

- LED signal strength indicators (red, green, yellow) to show misalignment of the units
- Supply connections reversepolarity protected
- Power indicator (on WS 6 light sender)
- Switching output short-circuit protected
- LIGHT- or DARK-switching (L/D control wire)
- Sensitivity adjustment
- No false triggering on power-up
- Insensitive to ambient light
- Glassfiber-reinforced plastic housing





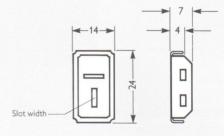
- 1 Power indicator (WS 6): comes on when power is switched on. Status indicator (WE 6): comes on when the light received is sufficient.
- 2 Connecting cable, O. D. 4.2 mm, 2 m long
- 3 Mounting holes, I. D. 3.5 mm (M3)
- 4 WE 6: Signal strength indicators (yellow, green, red)
- **6** WE 6: Fine sensitivity control
- 6 WE 6: Coarse sensitivity control

For mounting bracket (included), see page 51.

#### Slotted masks (accessories)

are available to detect small objects or to increase the operating precision.

The slotted mask should be mounted so that the top slot is perpendicular to the travelling direction of the object to be detected.

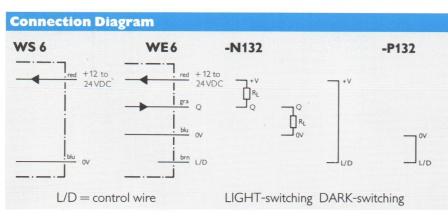


Slotted mask	Slotted mask placement	Scanning width	Scanning distance
None		7 mm	5 m
BL 20 2 mm slot	on sender or receiver	7 mm	3 m
Part No. 5304144	on sender and receiver	2 mm	2 m
BL 10 1 mm slot	on sender or receiver	7 mm	2 m
Part No. 5304143	on sender and receiver	1 mm	1 m
<b>BL 05</b> 0.5 mm slot	on sender or receiver	7 mm	1.5 m
Part No. 5304142	on sender and receiver	0.5 mm	0.5 m

# WS 6/WE 6 Through-beam Photoelectric Switch

WS/WE 6	WS 6 Sender	WE 6 Receiver N I 32	WE6-P132
Part No.	1)	6 007 356 <sup>1)</sup>	6 007 3551)
Scanning distance	5 m		
Supply voltage V <sub>S</sub>	12 to 24 VDC (±20%	6)	
Current consumption max.	40 mA		
Ripple max. <sup>2)</sup>	5 V <sub>pp</sub>		
Light source	LED (infrared)	_	
Light receiver		LIGHT- or DARK-switching (L	/D control wire)
Sensitivity		adjustable (fine/coarse control	)
Signal strength indicators		LEDs (yellow, red, green)	
Switching output		NPN	PNP
Output voltage max.		30 VDC	
Output current max.		100 mA	
Response time; switching frequency <sup>3)</sup>		max. 1 ms; max. 500 /s	
Enclosure rating	IP 66		
Circuit protection	supply connections re-	verse-polarity protected; output sho	rt-circuit protected
Ambient temperature	-25 to +55°C		
Connecting cable (oiltight)	$4 \times 0.2 \text{ mm}^2$ , 2 m long		
Weight	100 g		
Part No. includes sender and receiver     Must not exceed max. supply voltage	3) With light/dark time ratio of 1	11	
Accessories (included)	2 metal mounting brace	kets, 1 screwdriver, 4 screws M3 wit	h washers, nuts
(available)		(2 mm slot), Part No. 5 304 144, se	
		(1 mm slot), Part No. 5 304 143, se	1 0
		(0.5 mm slot), Part No. 5 304 142, s	

Switching mode	LIGH	T-switching	DARK-sv	vitching
Light received	yes	no	yes	no
'LIGHT' indicator	<b>&gt;⊗</b> €	8	>⊗<	8
Load R <sub>L</sub>	energized	de-energized	de-energized	energized
NPN output	LOW	HIGH	HIGH	LOW
PNP output	HIGH	LOW	LOW	HIGH



Note: Switch should not be operated unless the control wire (brown) is connected to +V or 0 V.

red	gra	blu	brn
red	grey	blue	brown
+V	Q	OV	L/D



Dimensions in mm



#### **Scanning Distance**

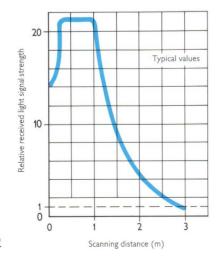


2 m

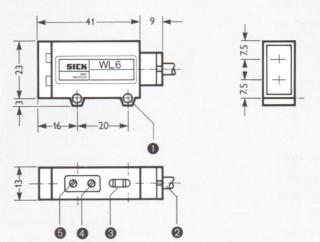


#### **Features**

- LED signal strength indicators (red, green, yellow) to show misalignment of the unit
- Supply connections reversepolarity protected
- Switching output short-circuit protected
- LIGHT- or DARK-switching (L/D control wire)
- Sensitivity adjustment
- No false triggering on power-up
- Insensitive to ambient light
- Glassfiber-reinforced plastic housing



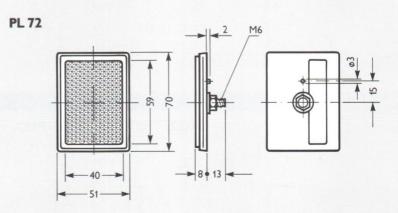
#### WL 6



- 1 Mounting holes, I.D. 3.5 mm (M3)
- 2 Connecting cable, O.D. 4.2 mm, 2 m long
- 3 LED signal strength indicators (yellow, green, red)
- 4 Fine sensitivity control
- 6 Coarse sensitivity control

For mounting bracket (included), see page 51.

Reflector PL 72 (included), Part No. 5304145

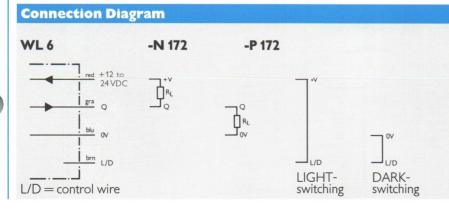


# WL 6

# **Photoelectric Reflex Switch**

WL 6	-N 172	-P I72
Part No.	6 007 024	6 007 025
Scanning range		
With PL 72 reflector	0.1 to 2 m	
Supply voltage V <sub>S</sub>	12 to 24 VDC (±20%)	
Current consumption max.	40 mA	
Ripple max. <sup>1</sup> )	5 V <sub>pp</sub>	
Light source	LED (infrared)	
Light receiver	LIGHT- or DARK-switc	hing (L/D control wire)
Sensitivity	adjustable (fine/coarse	control)
Signal strength indicators	LEDs (yellow, green, re-	d)
Switching output	NPN	PNP
Output voltage max.	30VDC	
Output current max.	100 mA	
Response time; switching frequency <sup>2</sup> )	max. 0,7 ms; max. 700/	S
Enclosure rating	IP 66	
Circuit protection	supply connections reve	erse-polarity protected; output short-circuit protected
Ambient temperature	−25 to +55°C	
Connecting cable (oiltight)	$4 \times 0.2 \text{ mm}^2$ , 2 m long	
Weight	100 g	
Must not exceed max. supply voltage     With light/dark time ratio of 1:1		
Accessories (included)	1 reflector PL 72, 1 meta 2 screws M3 with washe	al mounting bracket, 1 screwdriver,

Switching mode	LIGH	T-switching	DARK-	-switching
Light received	yes	no	yes	no
'LIGHT' indicator	>⊗∈	8	>⊗€	8
Load R <sub>L</sub>	energized	de-energized	de-energized	energized
NPN output	LOW	HIGH	HIGH	LOW
PNP output	HIGH	LOW	LOW	HIGH



Note: Switch should not be operated unless the control wire (brown) is connected to +V or 0 V.

red	gra	blu	brn
red	grey	blue	brown
+V	Q	0V	L/D





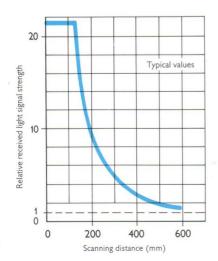


300 mm



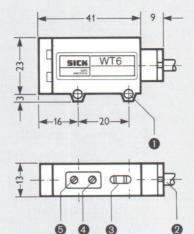
#### **Features**

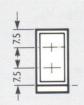
- LED signal strength indicators (red, green, yellow) to show misalignment of the unit
- Supply connections reversepolarity protected
- Built-in switching amplifier
- LIGHT- or DARK-switching (L/D control wire)
- Sensitivity adjustment
- Insensitive to ambient light
- Glassfiber-reinforced plastic housing



WT 6

Dimensions in mm





- 1 Mounting holes, I.D. 3.5 mm (M3)
- 2 Connecting cable, O.D. 4.2 mm, 2 m long
- 3 LED signal strength indicators (yellow, green, red)
- 4 Fine sensitivity control
- 6 Coarse sensitivity control

For mounting bracket (included), see page 51.

#### Accessories

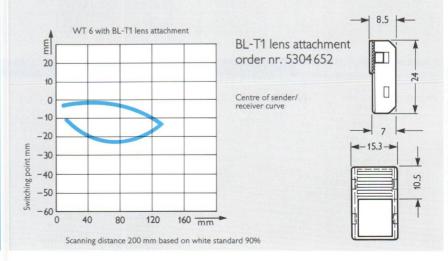
Scanning principle: Energetic, V system

#### Application:

Increased sensitivity with reduced scanning distance
 White standard 90%-t<sub>w</sub> 90 mm

Grey kodak 18%-t<sub>w</sub> 65 mm

Suppression of irritating background reflexes with reduced scanning distance

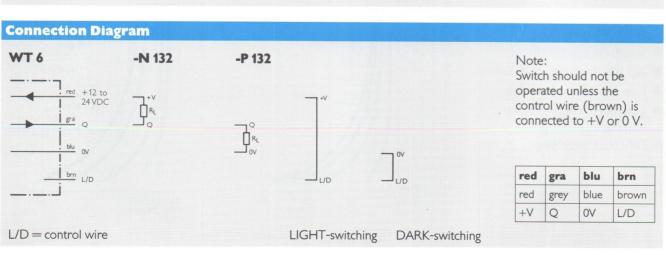


# WT 6

# **Photoelectric Proximity Switch**

WT6	-N 132	-P 132			
Part No.	6007026	6007 027			
Scanning distance	300 mm <sup>1</sup> )				
Supply voltage V <sub>S</sub>	12 to 24 VDC (±20%)				
Current consumption max.	40 mA				
Ripple max. <sup>2</sup> )	5 V <sub>pp</sub>				
Light source	LED (infrared)				
Light receiver	LIGHT- or DARK-switching (L/D control wire)				
Sensitivity	adjustable (coarse/fine	control)			
Signal strength indicators	LEDs (yellow, red, gree	n)			
Switching output	NPN	PNP			
Output voltage max.	30VDC				
Output current max.	100 mA				
Response time; switching frequency <sup>3</sup> )	max. 0.7 ms; max. 700 /	/s			
Enclosure rating	IP 66				
Circuit protection	supply connections reve	erse-polarity protected			
Ambient temperature	-25 to +55°C				
Connecting cable (oiltight)	$4 \times 0.2 \text{ mm}^2$ , 2 m long				
Weight	100 g				
1) Based on paper, white standard, 200 × 200 mm <sup>2</sup> 2) Must not exceed max. supply voltage 3) With light/dark time ratio of 1:1					
Accessories (included)	1 metal mounting bracke	et, 1 screwdriver, 2 screws M3 with washers, nuts			

Switching mode	LIGH	LIGHT-switching		DARK-switching		
Light received	yes	no	yes	no		
'LIGHT' indicator	>⊗∈	8	>⊗∈	8		
Load R <sub>L</sub>	energized	de-energized	de-energized	energized		
NPN output	LOW	HIGH	HIGH	LOW		
PNP output	HIGH	LOW	LOW	HIGH		







150 mm max.

For through-beam applications

#### **Scanning Distance**



50 mm max.

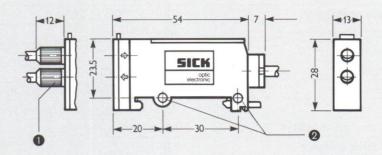
For proximity applications

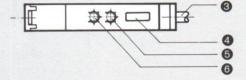
#### **Features**

- Interchangeable fiber-optic cables in 1 or 2 tip configurations
- Various fiber-optic cable types and lengths available
- LED signal strength indicators (red, green, yellow) to show misalignment of the unit
- Supply connections reversepolarity protected
- Switching output short circuit protected
- LIGHT- or DARK-switching (L/D control wire)
- Sensitivity adjustment
- No false triggering on power-up
- Insensitive to ambient light
- Glassfiber-reinforced plastic housing
- DIN track mounting

#### WLL 6

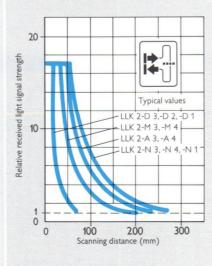
Dimensions in mm

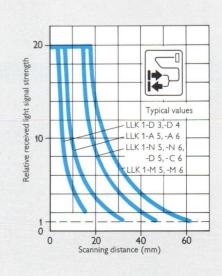




- Fiber-optic cable connector
- 2 Mounting holes, I.D. 3.5 mm (M3)
- 3 Connecting cable, O.D. 4.2 mm, 2 m long
- 4 LED signal strength indicators (yellow, green, red)
- 6 Fine sensitivity control
- 6 Coarse sensitivity control

For mounting bracket (included), see page 51. For fiber-optic cables (accessories), see page 48.





# WLL 6 Photoelectric Fiber-optic Switch

WLL 6	-N 112	-P 112	-N 122	-P 122			
With interchangeable fiber-optic cables							
Part No.	6007 031	6007032	6007033	6007034			
Scanning distance	see page 46 ar	nd 48					
Supply voltage V <sub>s</sub>	12 to 24 VDC	(±20%)					
Current consumption max.	50 mA			5 20 1 1 2 2 2			
Ripple max. <sup>1</sup> )	5 V <sub>pp</sub>						
Light source	LED (infrared)	)	LED (red)				
Light receiver	LIGHT- or DA	ARK-switching (L/D c					
Sensitivity	adjustable (coarse/fine control)						
Signal strength indicators	LEDs (yellow, red, green)						
Switching output	NPN	PNP	NPN	PNP			
Output voltage max.	30 VDC						
Output current max.	100 mA						
Response time; switching frequency <sup>2</sup> )	max. 0.7 ms; m	nax. 700 /s					
Enclosure rating	IP 66						
Circuit protection	supply connect	tions reverse-polarity	protected; output sl	hort circuit protected			
Ambient temperature	-25 to +50°C						
Connecting cable (oiltight)	$4 \times 0.2 \text{ mm}^2, 2$	m long					
Weight	100 g	, in the second					
1) Must not exceed max. supply voltage 2) With light/dark time ratio of 1:1							
Accessories (included)	1 metal mount	ing bracket, 1 screwd	river, 2 screws M3 w	vith washers, nuts			

Switching mode	LIGH	LIGHT-switching		DARK-switching		
Light received	yes	no	yes	no		
'LIGHT' indicator	>⊗∈	8	>⊗∈	8		
Load R <sub>L</sub>	energized	de-energized	de-energized	energized		
NPN output	LOW	HIGH	HIGH	LOW		
PNP output	HIGH	LOW	LOW	HIGH		

# WLL 6 -N 112, -N 122 -P 112, -P 122 Tred +12 to 24 VDC RRL Q RL Q RL Q V L/D = control wire LIGHT-switching DARK-switching

Note: Switch should not be operated unless the control wire (brown) is connected to +V or 0 V.

red	gra	blu	brn
red	grey	blue	brown
+V	Q	0V	L/D

### Selection Table of Fiber-optic Cables for WLL 6



#### Sender and receiver fibers in separate tips for through-beam applications

Model	LLK2-N3	LLK2-N4	LLK2-N1	LLK2-A3	LLK2-A4	LLK2-D3	LLK2-D1	LLK2-D2	LLK2-M3	LLK2-M4	LLK2-M7
Part No.	5304146	5304147	5304148	5 3 0 4 1 4 9	5 3 0 4 1 5 0	5 3 0 4 1 5 1	5304152	5 3 0 4 1 5 3	5304154	5304155	5304156
Туре	M4 Standard	M4 Standard	M3 Standard	M4 Coiled	M4 Coiled	M4 Fine	M3 Fine	M3 Fine	M4 Multiple	M4 Multiple	Multiple fibers, all in a line
-71-	Special tip adapters available			Special tip adapters available		Special tip adapters available			Special tip adapters available		
Light spot	Ø1mm			Ø 0.5 mm			Ø 0.25 mr	n <sup>1</sup> )	0.25 mm		
Scanning distance	150 mm [30 mm] 120 mm			50 mm [10 mm]			100 mm [20 mm]				
Armor/core	PE/PMMA										
Ambient temperature	-25  to  + 6	50°C									
Minimum bending radius	25 mm					15 mm			7.5 mm		
Cable length	2 m						that a				
Accessories <sup>2</sup> )	cable cutte	r, adapters									
Features and advantages	Long scanning distance (1.5 m with BF-L tip adapter)	Extended reach	Space- saving mounting; long scanning distance	Coiled cab it possible mount the moving pa machine.	to tips on	Cable O.D. =1 mm	Cable O.D. =1 mm	Cable O.D. =1 mm	Smallest pobending ra		Well suited for detecting oblong marks or small objects

#### Selection Table of Fiber-optic Cables for WLL 6



#### Sender and receiver fibers in a single tip for proximity applications

										THE RESIDENCE		
Model	LLK1-N5	LLK1-N6	LLK1-A5	LLK1-A6	LLK1-D3	LLK1-D4	LLK1-C5	LLK1-C6	LLK1-M5	LLK1-M6	LLK1-M7	LLK1-C8
Part No.	5304157	5304158	5304159	5304160	5304161	5304162	5304163	5304164	5304165	5304166	5304167	5304168
Туре	M 6x0.75 Standard	M 6x0.75 Standard	M6x0.75 Coiled	M 6x0.75 Coiled	M4 Fine	M4 Fine	M4/ M6x0.75 Coaxial	M4/ M6x0.75 Coaxial	M4/ M6x0.75 Multiple fibers	M4/ M6x0.75 Multiple fibers	Multiple fibers, all in a line	Multiple fibers
Light spot	Ø1×2				Ø 0.5 x 2		Ø1, Ø 0.2	5 × 16	Ø 0.25 x	16 × 2	0.25×16×2	Ø 1, Ø 0.25 × 16
Scanning distance <sup>3</sup> )	50 mm [10 mm] 15 mm		15 mm [3	mm]	50mm [10mm]		30mm [6mm]		30 mm [6 mm]			
Armor/core	PE/PMM/	Ą										
Ambient temperature	-25 to +	60°C							1.85-12.2			47 (2 17-11
Minimum bending radius	25 mm				15 mm 25 mm			7.5 mm				
Cable length	2 m											90 mm
Accessories <sup>2</sup> )	cable cutt	er, adapter:	s									-
Features and advantages	Standard type	Extended reach	it possible mount the		Cable O.D. =1 mm Space- saving mounting	Cable O.D. = 1 mm Sleeve Ø1.5 mm	Well suite for position or detection wires	oning	Smallest p bending r		Well suited for de- tecting wide marks or moving objects	No further mounting nesess- ary

1) with WLL 6-.122 / 2 m long (with WLL 6-.112 / 0.5 m long)
2) included
3) with WLL 6-.122 / 2 m long (with WLL 6-.112 / 0.5 m long) based on paper, white standard, 30 x 30 mm<sup>2</sup>

Standard models are printed in **boldface** 

#### 2-tip Configuration

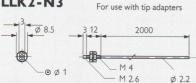


Note: The fiber-optic cables are made up by tightening the adapter sleeves at the length required. The salient parts are cut using the cable cutter.

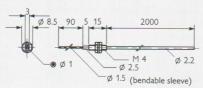
For through-beam applications

#### Standard types

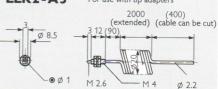




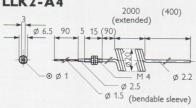
#### LLK2-N4



#### LLK2-A3 For use with tip adapters



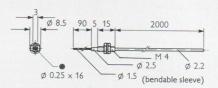
LLK2-A4



#### LLK2-M3



#### LLK2-M4



#### **I-tip Configuration**

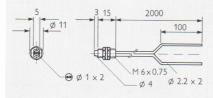


Dimensions in mm

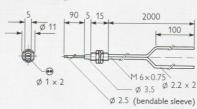
For proximity applications

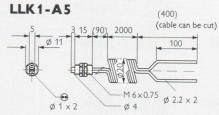
#### Standard types

#### LLK1-N5

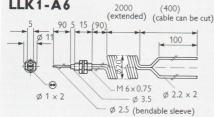


#### LLK1-N6

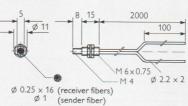




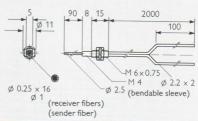
#### LLK1-A6



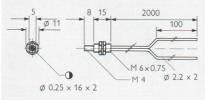
#### LLK1-C5



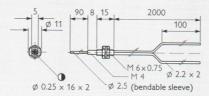
LLK1-C6



#### LLK1-M5

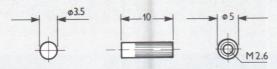


#### LLK1-M6



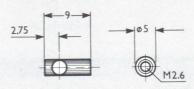
Accessories for Fil	ber-optic Cables			
	Tip adapter	Right-angle tip adapter	Right-angle tip adapter	Angular reflection tip adapter
Model	BF-L	BF-S	BF-D	BF-R
Part No.	5 304 137	5 304 138	5 304 139	5 304 140
Туре	160-016	L B. B.		
Features and advantages	Long scanning distances	Through beam applications; parallel installation	Reflective-type applications; space-saving mounting	Defined scanning distances; high sensitivity
For use with	LLK2-N3, L	LK2-A3, LLK2-D3, LLK2-M3	LLK2-N3	
Scanning distance of WLL 6-N/P122 and LLK 2-N3	10 x	1.5 x	35 mm, based on paper, white standard, 30 × 30 mm <sup>2</sup>	10 ± 2 mm Light spot min. 1 mm

#### BF-L Tip adapter

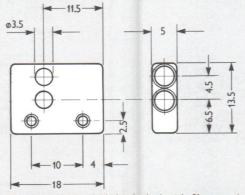


#### BF-S Right-angle tip adapter

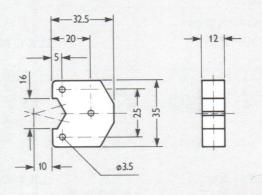
BF-R Angular reflection tip adapter



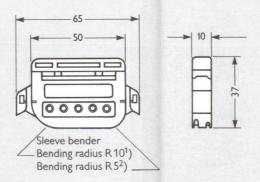
#### BF-D Right-angle tip adapter



FC Cable cutter, Part No. 5 304 141 (included with fiber-optic cables)\*



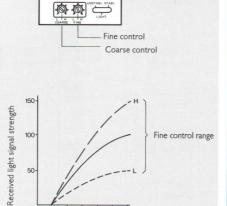
Dimensions in mm



<sup>1)</sup> Sleeves Ø 2.5 mm and 1.5 mm 2) Sleeves Ø 0.9 mm

If the light received is insufficient use the procedure described in the table below to adjust the sensitivity. Be sure the following conditions are met:

- If no sensitivity adjustment is necessary, the adjusters should be set to the "H" ends of the scales.
- Use the screwdriver supplied with the unit to adjust the sensitivity.
   To avoid damaging the adjusters do not turn them past the ends of the scales.
- If the light incidence varies, check to see if any of the environmental conditions have changed (temperature, voltage, dirty optics, misalignment).



Coarse control range

Sensitivity control	Condition to be met	Adjustment	Remarks		
	Reflex and through- beam with an unin- terrupted light beam	Turn the COARSE control toward "L" and further on to "H" until the red LED	If the LED does not go off, consider point A to be at "L". If the LED does		
COARSE	Proximity with the object present	goes on. Call this point A.	not go on, check mounting instructions.		
A C B	Reflex and through- beam with an inter- rupted light beam	Turn the coarse control toward "H" and further on to "L" until the red LED goes off. Call this point B.	If the LED does not come on, consider point B to be at "H". If the LED does not go off, consider point		
Proximity with the object absent		Set the COARSE control at the point halfway between points A and B (=point C).	B to be at L. Use fine control to adjust the sensitivity.		
	Reflex and through- beam with an unin- terrupted light beam	Turn the FINE control toward "L" and further on to "H" until the red LED	If the LED does not go off, consider point A to be at "L".		
FINE	Proximity with the object present	goes on. Call this point A.	If the LED does not come on, check mounting instructions.		
Reflex and through- beam with an inter- rupted light beam		Turn the FINE control toward "H" and further on to "L" until the red LED goes off. Call this point B. Set the	If the LED does not come on, consider point B to be at "H". If the LED does not go off, check mounting		
FINE	Proximity with the object absent	fine control at the point half- way between points A and B (= point C).	instructions (possibly shield required).		

寧尊

LIGHT

red

ON

ON

OFF

OFF

UNSTABLE

yellow

OFF

OFF

ON

OFF

Strength of

received

>130%

100-130%

70-100%

< 70%

light

Condition of

light received

good

sufficient

no light

insufficient

STABLE

LIGHT

STABLE

green

ON

OFF

OFF

OFF

Output

DARK-

OFF

OFF

ON

ON

switching

LIGHT-

ON

ON

OFF

OFF

switching

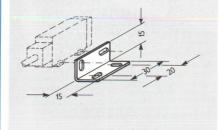
#### **Mounting Instructions**

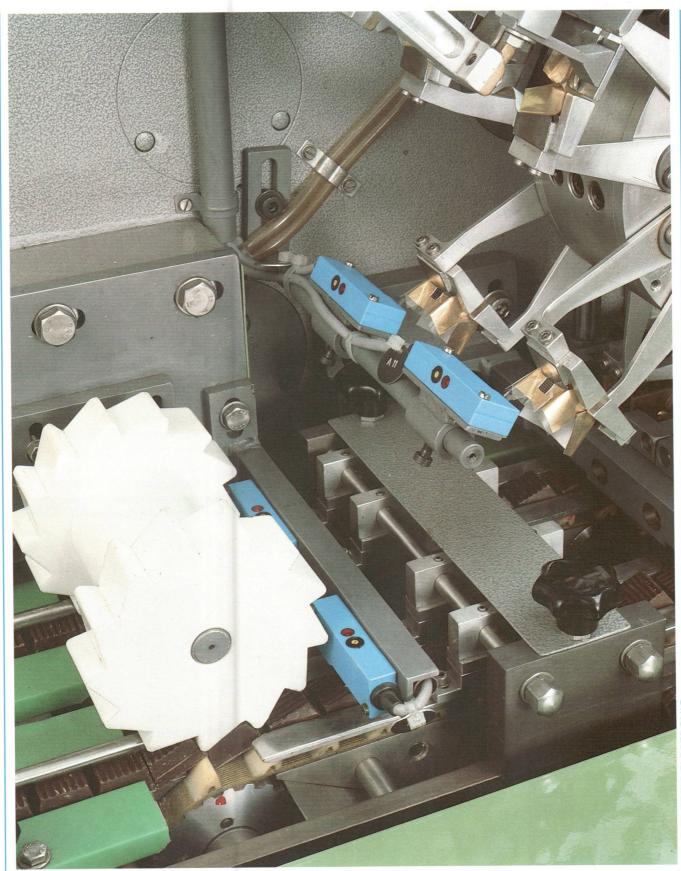
- Align the unit by sight and mount it temporarily, that is don't tighten the screws completely.
- Pan the unit in the horizontal and vertical planes. Tighten the screws completely at the point halfway between where the red LED (LIGHT) comes on and where it goes off.
- Check to see that the red (and possibly the green) indicator comes on when the light beam is uninterrupted (through-beam and reflex), or when the object is present (proximity).
- Check to see that the yellow indicator comes on when the light beam is interrupted (throughbeam and reflex), or when the object is absent (proximity).
- The best possible alignment is obtained when the green (STABLE) and red (LIGHT) indicators are on.
- With reflective objects that are difficult to detect the photoelectric proximity switch should be mounted at a 5 to 15° angle.

#### **Mounting Brackets**

WLL 6

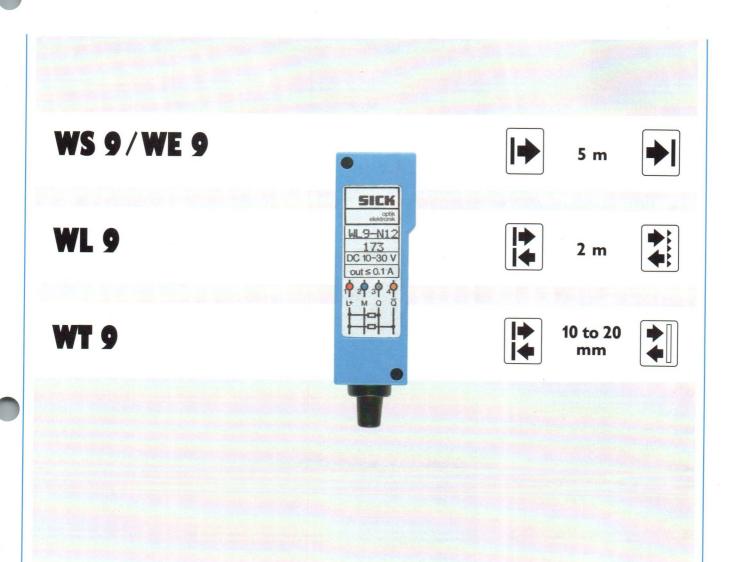
WL 6, WT 6 WS 6, WE 6





52 WT 9 photoelectric proximity switches monitoring delivery of product and packaging material on a sweet packaging machine

# W 9-Series Photoelectric Switches



Slim-line switches in a glassfiber-reinforced plastic housing.

With sensitivity control and blinking signal strength indicator for monitoring dirt build-up and to show misalignment.

Polarizing filter with WL 9 photoelectric reflex switch.

Supply voltage from 10 to 30 V.

Complementary switching outputs for light-switching and dark- switching modes. Outputs short circuit protected, NPN or PNP versions available.

Insensitive to ambient light through interference suppression.

Available as through-beam photoelectric switch (with test input to test the sensor on demand from a remote location), as photoelectric reflex switch and as photoelectric proximity switch.



Behind the precision optics there is a polarizing filter, which enables objects with reflecting surfaces to be detected.



Signal strength indicator and sensitivity control

SICK OPTIC-ELECTRONIC



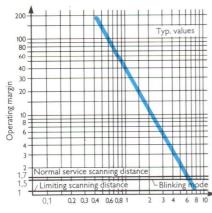


5 m



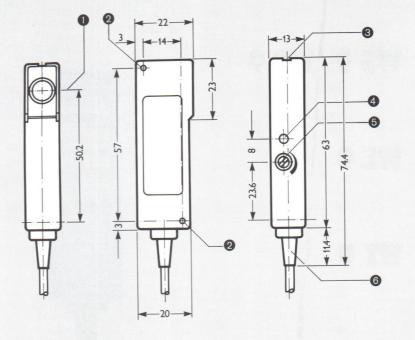
#### **Features**

- Blinking LED signal strength indicator to show misalignment and dirt build-up on optics
- Supply connections reversepolarity protected
- Power indicator for light sender (WS); signal strength indicator for light receiver (WE)
- Complementary switching outputs Q and Q (light- and dark-switching)
- Switching outputs short circuit protected
- Insensitive to ambient light
- Test input to test sensor on demand from remote location
- No false triggering on power-up
- Glassfiber-reinforced plastic housing



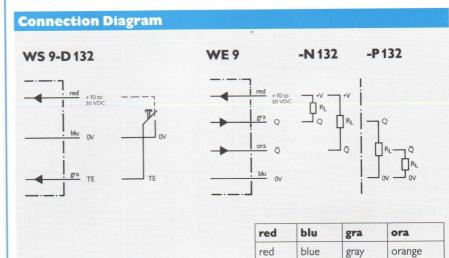
## WS 9/WE 9

Dimensions in mm



- Centre of optical axis
- 2 Mounting holes, I.D. 3.2 mm
- Alignment sight
- Signal strength indicator on WE 9 Power indicator on WS 9
- Sensitivity control on WE
- 6 Connecting cable, 2 m long

For mounting bracket (accessories), Part No. 2009120, see page 147.



# WS 9 / WE 9 **Through-beam Photoelectric Switch**

WS 9/WE 9	Light Sender WS 9-D 132	Light Receiver WE 9-N 132	WE 9-P 132	
Part No.		1010904	1010905	
Type of connection	cable			
Mounting bracket, Part No.	2009120			
Scanning range	0 to 5 m			
Supply voltage V <sub>S</sub>	10 to 30 VDC (limit value	es)		
Current consumption (no load)	≦20 mA	≦30 mA		
Ripple <sup>1</sup> )	≦5 V <sub>PP</sub>	≦5 V <sub>PP</sub>		
Indicators	LED power indicator, red		indicator, red	
Light source	IR LED, modulated, avera			
Angle of dispersion / angle of reception	approx. 3.5°			
Light spot diameter	approx. 300 mm at a dista	ance of 5 m		
Light receiver switching mode		LIGHT- and DARK-	-switching	
Sensitivity	- adjustable (270°-potentiometer)			
Signal strength indicator	- LED			
Switching outputs Q and Q		NPN	PNP	
Signal voltage HIGH	-	approx. V <sub>s</sub>	V <sub>s</sub> − (≦1.5 V)	
Signal voltage LOW³)		≦1.5 V	approx. 0 V	
Output current max.	_	100 mA		
Response time <sup>4</sup> ); switching frequency <sup>5</sup> )	- 11	≤200 μs; max. 2500	O/s	
Test input	light source disconnected			
Internal resistance	≥22 kΩ		1971 20-10 (0.10)	
Light source ON	test input to V <sub>s</sub> or not con	nected		
Light source OFF	test input to 0 V			
Enclosure rating	IP 67			
Circuit protection <sup>6</sup> )	A, B, C			
Ambient operating temperature <sup>7</sup> )	−25 to +55°C			
Storage temperature <sup>7</sup> )	-40 to +75°C			
Connecting cable	2 m, PVC, 3 x 0.25 mm <sup>2</sup>	2 m, PVC, 4 x 0.25 r	mm², O.D. 5 mm	
Weight (incl. cable)	approx. 100 g	approx. 100 g	approx. 100 g	
1) Must be within V <sub>s</sub> tolerances 2) At room temperature = +.25°C	5) With light/dark time ratio of 1:1  6) A = supply connections reverse-pole		111 0	

<sup>2)</sup> At room temperature = +25°C
3) At room temperature = +25°C
and output current of 100 mA
4) With resistive load

<sup>S) Will igilize the ratio of 1:1

6) A = supply connections reverse-polarity protected B = outputs Q and Q short circuit protected C = interference suppression

7) Do not distort cable below 0°C</sup> 



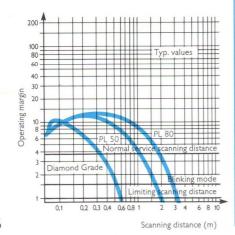


2 m

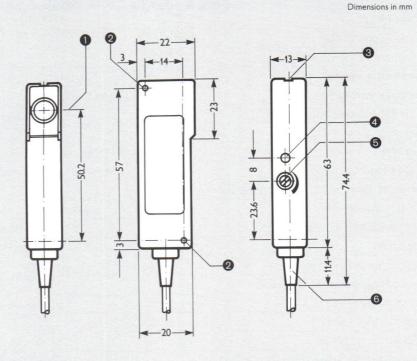


#### **Features**

- Polarizing filter, enabling objects even with reflecting surfaces to be detected
- Blinking LED signal strength indicator to show misalignment and dirt build-up on optics
- Supply connections reversepolarity protected
- Complementary switching outputs Q and Q (light- and dark-switching)
- Switching outputs short circuit protected, PNP or NPN
- Insensitive to ambient light
- No false triggering on power-up
- Glassfiber-reinforced plastic housing



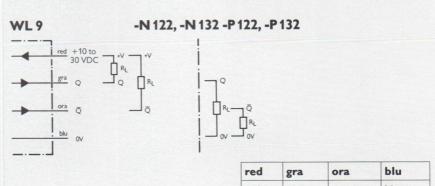
WL9



- Centre of optical axis
- 2 Mounting holes, I.D. 3.2 mm
- Alignment sight
- 4 Signal strength indicator
- Sensitivity control
- 6 Connecting cable, 2 m long

For reflectors (accessories), see page 144. For mounting bracket (accessories), Part No. 2009120, see page 147.

#### **Connection Diagram**



# WL 9 **Photoelectric Reflex Switch**

WL9	-N 122	-P 122	-N 132	-P 132			
Part No.	1006389	1006388	1005709	1005 708			
Type of connection	cable						
Mounting bracket, Part No.	2009120						
Scanning range							
With PL 80 reflector	Part No. 1003 86	65 0 to 0.3 m	0 to 2.0 m				
With PL 50 reflector	Part No. 100013	32 0 to 0.2 m	0 to 1.2 m				
With PL 30 reflector	Part No. 100231	14 0 to 0.15 m	0 to 0.9 m				
With "Diamond Grade" reflective tape	Part No. 4019 63	34 0 to 0.11 m	0 to 0.3 m				
Supply voltage V <sub>s</sub>	10 to 30 VDC (I	imit values)					
Current consumption (no load)	<50 mA						
Ripple <sup>1</sup> )	≦5 V <sub>pp</sub>						
Light source	LED, visible red light, modulated, average service life 100,000 h <sup>2</sup> )						
Light spot diameter		at a distance of 90 mm		at a distance of 1 m			
Light receiver switching mode	LIGHT- and DARK-switching						
Sensitivity	adjustable (270°	-potentiometer)					
Signal strength indicator	LED						
Switching outputs Q and Q	NPN	PNP	NPN	PNP			
Signal voltage HIGH	approx. V <sub>S</sub>	V <sub>S</sub> − (≦1.5 V)	approx. V <sub>s</sub>	V <sub>s</sub> − (≦1.5 V)			
Signal voltage LOW³)	≦1.5 V	approx. 0 V	≦1.5 V	approx. 0 V			
Output current max.	100 mA						
Response time <sup>4</sup> ); switching frequency <sup>5</sup> )	≦250 µs; max. 2	.000/s					
Enclosure rating	IP 67						
Circuit protection <sup>6</sup> )	А, В, С						
Ambient operating temperature <sup>7</sup> )	$-25 \text{ to } +55 ^{\circ}\text{C}$						
Storage temperature <sup>7</sup> )	$-40 \text{ to } +75 ^{\circ}\text{C}$						
Connecting cable	2 m, 4 x 0.25 mm	n <sup>2</sup> , PVC, O.D. 5 mm					
Weight (incl. cable)	approx. 100 g						

<sup>1)</sup> Must be within V<sub>s</sub> tolerances
2) At room temperature = +25°C
3) At room temperature = +25°C
and output current of 100 mA
4) With resistive load

<sup>5)</sup> With light/dark time ratio of 1:1
6) A = supply connections reverse-polarity protected B = outputs Q and Q short circuit protected C = interference suppression
7) Do not distort cable below 0°C



#### **Scanning Range**

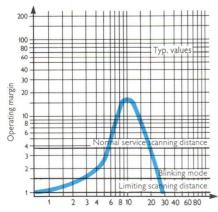


10 to 20 mm

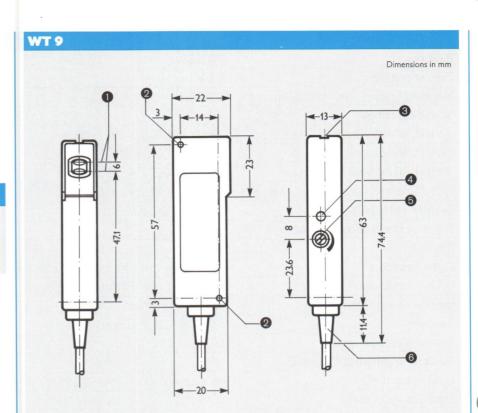


#### **Features**

- Blinking LED signal strength indicator to show misalignment and dirt build-up on optics
- Supply connections reversepolarity protected
- Complementary switching outputs Q and Q (light- and dark-switching)
- Switching outputs short circuit protected, PNP or NPN
- Insensitive to ambient light
- No false triggering on power-up
- Glassfiber-reinforced plastic housing



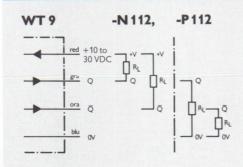
Scanning distance (mm)



- Centre of optical axis: point of intersection at a distance of approx. 15 mm
- 2 Mounting holes, I.D. 3.2 mm
- Alignment sight
- 4 Signal strength indicator
- 6 Sensitivity control
- 6 Connecting cable, 2 m long

For mounting bracket (accessories), Part No. 2009120, see page 147.

#### **Connection Diagram**



red	gra	ora	blu
red	gray	orange	blue

# **Photoelectric Proximity Switch**

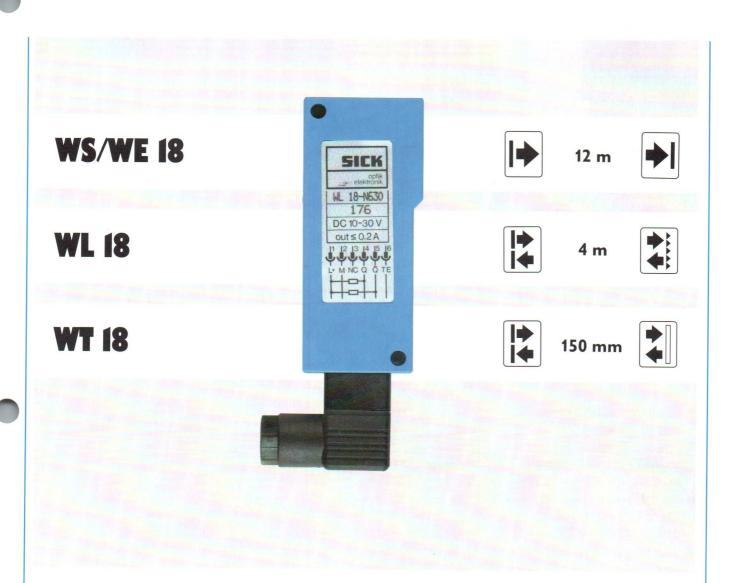
WT 9	-N 112	-P II2				
Part No.	1005 705	1005 704				
Type of connection	cable					
Mounting bracket, Part No.	2009120					
Scanning range <sup>1</sup> )	10 to 20 mm					
Supply voltage V <sub>s</sub>	10 to 30 VDC (limit valu	es)				
Current consumption (no load)	<50 mA					
Ripple <sup>2</sup> )	≦5 V <sub>pp</sub>					
Light source		l, average service life 100,000 h³)				
Light spot diameter	3 mm at a distance of 15 mm					
Light receiver switching mode	LIGHT- and DARK-switching					
Sensitivity	adjustable (270°-potentiometer)					
Signal strength indicator	LED					
Switching outputs Q and Q	NPN	PNP				
Signal voltage HIGH	approx. V <sub>S</sub>	V <sub>s</sub> − (≦1.5 V)				
Signal voltage LOW <sup>4</sup> )	≦1.5 V	approx. 0 V				
Output current max.	100 mA					
Response time <sup>5</sup> ); switching frequency <sup>6</sup> )	≦700 µs; max. 700/s					
Enclosure rating	IP 67					
Circuit protection <sup>7</sup> )	A, B, C					
Ambient operating temperature 8)	-25 to +55°C					
Storage temperature 8)	-40 to +75 °C					
Connecting cable	2 m, 4 x 0.25 mm <sup>2</sup> , PVC,	O.D. 5 mm				
Weight (incl. cable)	approx. 100 g					

<sup>1)</sup> Material with 6% reflectance (based on white standard, to DIN 5033)
2) Must be within V₅ tolerances
3) At room temperature = +25°C
4) At room temperature = +25°C and output current of 100 mA

<sup>5)</sup> With resistive load
6) With light/dark time ratio of 1:1
7) A = supply connections reverse-polarity protected B = outputs Q and Q short circuit protected C = interference suppression
8) Do not distort cable below 0°C



## **W 18-Series Photoelectric Switches**



Photoelectric switches in glassfiberreinforced plastic housings. WT 18 photoelectric proximity switch with continuously adjustable scanning range and defined background suppression.

Polarizing filters on WL 18 reflex switch.

With sensitivity control on WL 18 and blinking LED signal strength indicator to show misalignment or dirty optics and to signal maintenance alarm.

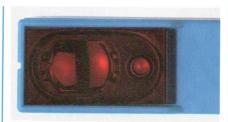
Available with non-detachable cable (enclosure rating IP 67) and 6-pin plug (enclosure rating IP 65). Supply voltage from 10 to 30 V.

Insensitive to ambient light through pulse modulation.

Complementary switching outputs for light- and dark-switching modes.

Outputs short circuit protected; NPN or PNP versions available.

Available as through-beam photoelectric switches, as photoelectric reflex switches and as photoelectric proximity switches.



Alignment sight and signal strength indicator at front for simple adjustment (WL 18).



Signal strength indicator with sensitivity or background suppression control.

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#### **Scanning range**

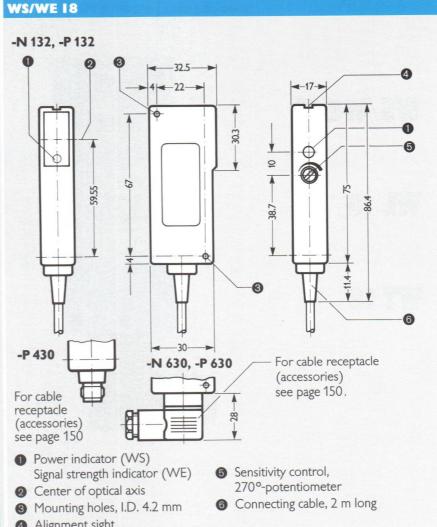


12 m



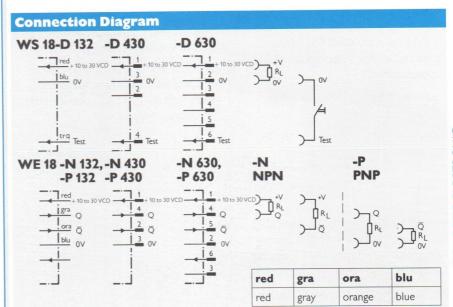
#### **Features**

- Blinking LED signal strength indicator to show misalignment or dirty optics and to signal maintenance alarm
- Supply connections reversepolarity protected
- Power indicator for the light source (WS), signal strength indicator for the receiver (WE)
- Complementary switching outputs O and Q for light- and dark-switching modes
- Switching outputs short circuit protected
- Insensitive to ambient light
- Test input for testing device and system
- No false triggering on power up
- Glassfiber-reinforced plastic housing



4 Alignment sight

For mounting bracket (accessories) see page 147.



## **WS/WE 18**

# Through-beam photoelectric switch

W\$/WE 18	WS 18 -D 132	-D 430	-D 630	WE 18 -N 132	-N 630	-P 132	-P 430	-P 630
Part No.				1010908	1010910	1010909	1010824	1010911
Type of connection	Cable	4-pin plug	6-pin plug	Cable	6-pin plug	Cable	4-pin plug	6-pin plug
Cable receptacle		page 150	page 150		page 150	-	page 150	page 150
Mounting bracket , Part no.	2009317							
Scanning range <sup>1)</sup>	12 m / 10 m							
Supply voltage Vs	10 to 30	VDC <sup>2)</sup>						
Current consumption (no load)	≦30 mA			≤30 mA (	WS), ≦ 35 n	nA (WE)		
Ripple <sup>3)</sup>	≤5 V <sub>ss</sub>							
Light source	LED, IR, modulated, av. service life 100,000 h <sup>4)</sup>							
Transistor outputs				NPN, Q and $\overline{Q}$		PNP, Q and $\overline{Q}$		
Signal voltage HIGH				approx. V <sub>S</sub>		V <sub>S</sub> − (≦1.5 V)		
Signal voltage LOW <sup>5)</sup>				≤1.5 V approx. 0 V			V	
Output current I <sub>A</sub> max.				100 mA				
Response time <sup>6)</sup> ; switching freq. max. <sup>7)</sup>	≤ 500 μs	; 1000/s						
Test input »TE«	light sour	ce deactivate	ed					
Input resistance	≥ 22 kΩ							
Light source active	+V or no	t connected						
Light source inactive	0 V							
Enclosure rating	IP 67	IP 67	IP 65	IP 67	IP 65	IP 67	IP 67	IP 65
Circuit protection <sup>8)</sup>	A, B, C							
Ambient operating temperature 9)	-25 to +55 °C							
Storage temperature 9)	-40 to +75 °C							
Connecting cable	2 m			2 m		2 m	-	_
Weight	approx.1	00 g						
Typ. limit scanning distances (laboratory values)/	5) At room temperature = +25 °C and output current of 100 mA							

Typ. limit scanning distances (laboratory values)/
recommended normal service scanning distances
 limit value
 Must be within Vs tolerances
 At room temperature = +25 °C

<sup>5)</sup> At room temperature = +25 °C and output current of 100 mA
6) Response time with resistive load
7) With light/dark ratio of 1:1
8) A = supply connections reverse-polarity protected
B = outputs Q and Q short circuit protected
C = interference suppression
9) Do not distort cable below 0 °C

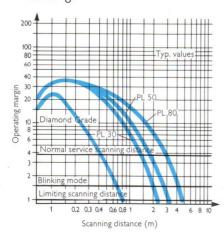


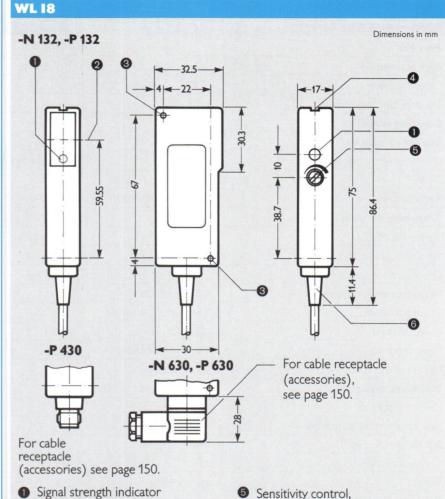




#### **Features**

- Polarizing filters, enabling objects even with reflecting surfaces to be detected
- Blinking LED signal strength indicator to show misalignment and dirt build-up on optics
- Supply connections reversepolarity protected
- Complementary switching outputs Q and Q (light- and dark-switching)
- Adjustable sensitivity
- Switching outputs short circuit protected
- Insensitive to ambient light
- Test input to test sensor on demand from remote location
- No false triggering on power-up
- Glassfiber-reinforced plastic housings



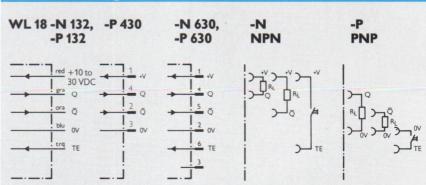


- Signal strength indicator
- 2 Center of optical axis
- 3 Mounting holes, I.D. 4.2 mm
- 4 Alignment sight

For reflectors (accessories), see page 144.

For mounting bracket (accessories), Part No. 2009 317, see page 147.

#### **Connection Diagram**



red	gra	ora	blu	trq		
red	gray	orange	blue	turquoise		

270°- potentiometer

6 Connecting cable, 2 m long

# **Photoelectric Reflex Switch**

WL 18	-N 132	-N 630	-P 132	-P 430	-P 630			
Part No.	1005 697	1006385	1005 696	1001818	1006384			
Type of connection	cable	6-pin plug	cable	4-pin plug	6-pin plug			
Cable receptacle, Part No.		page 150	<u> </u>	page 150	page 150			
Mounting bracket, Part No.	2009 317							
Scanning range <sup>1</sup> )								
With PL 80 reflector	Part No. 1003 865							
With PL 50 reflector	Part No. 1000132 0 to 2.8 m / 0 to 2.0 m							
With PL 30 reflector	Part No. 1002314	/ 0 to 1.5 m						
With "Diamond Grade" reflective tape	Part No. 4019 634							
Supply voltage V <sub>S</sub>	10 to 30 VDC <sup>2</sup> )							
Current consumption (no load)	≦50 mA							
Ripple <sup>3</sup> )	≤5 V <sub>pp</sub>							
Light source	LED, visible red light, modulated, average service life 100,000 h <sup>4</sup> )							
Light spot diameter	approx. 40 mm at a distance of 2 m							
Switching outputs Q and Q	NPN		PNP					
Signal voltage HIGH	approx. $V_S$ $V_S - (\leq 1.5 \text{ V})$							
Signal voltage LOW <sup>5</sup> )	≤1.5 V approx. 0 V							
Output current max.	200 mA							
Response time <sup>6</sup> ); switching frequency <sup>7</sup> )	≤ 500 µs; max. 1000/	's						
Test input	light source deactivate	ed			deactivated			
Input resistance	≥15 kΩ				15 k Ω			
Light source active	0 V or not connected		+ V or not con.		+ V			
Light source inactive	+ V		0 V		0 V			
Enclosure rating	IP 67	IP 65	IP 67		IP 65			
Circuit protection <sup>8</sup> )	A, B, C							
Ambient operating temperature <sup>9</sup> )	-25 to +55 °C							
Storage temperature <sup>9</sup> )	-40 to +75°C							
Connecting cable	2 m	2 m						
Weight	approx. 100 g							
1) Typ. limiting scanning distances (Jahoratory values) /	6) With resistive load							

<sup>1)</sup> Typ. limiting scanning distances (laboratory values) / recommended normal service scanning distances under industrial conditions.
2) Limit values
3) Must be within V<sub>s</sub> tolerances
4) At room temperature = +25 °C
5) At room temperature = +25 °C and output current of 100 mA

<sup>6)</sup> With resistive load
7) With light/dark time ratio of 1.1
8) A = supply connections reverse-polarity protected
B = outputs Q and Q short circuit protected
C = interference suppression
9) Do not distort cable below 0°C





# Adjustable Scanning Distance

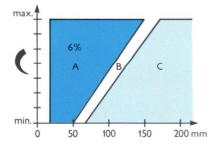


50 to 150 mm



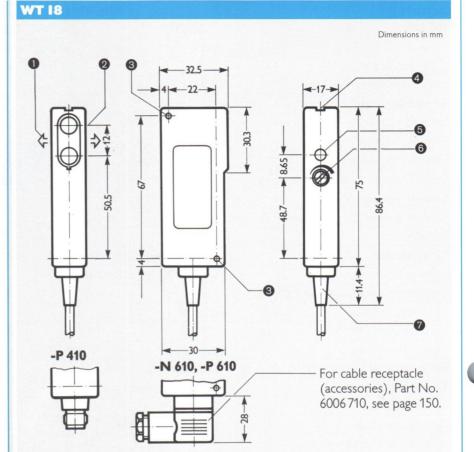
#### **Features**

- Scanning range continuously adjustable
- Background suppression
- Blinking LED signal strength indicator to show misalignment and dirt build-up on optics
- Supply connections reversepolarity protected
- Complementary switching outputs Q and Q (light- and dark-switching)
- Switching outputs short circuit protected
- Insensitive to ambient light
- No false triggering on power-up
- Glassfiber-reinforced plastic housing



Background suppression

- A = scanning range
- B = background suppression range
- C = background



For cable receptacle (accessories) see page 150.

- Direction of movement of object being scanned
- 2 Center of optical axis
- 3 Mounting holes, I.D. 4.2 mm
- 4 Alignment sight

- 6 Signal strength indicator
- 6 Scanning distance control (50 to 150 mm, approx. 2.5 turns)
- Connecting cable, 2 m long
- For mounting bracket (accessories), Part No. 2009 317, see page 147.

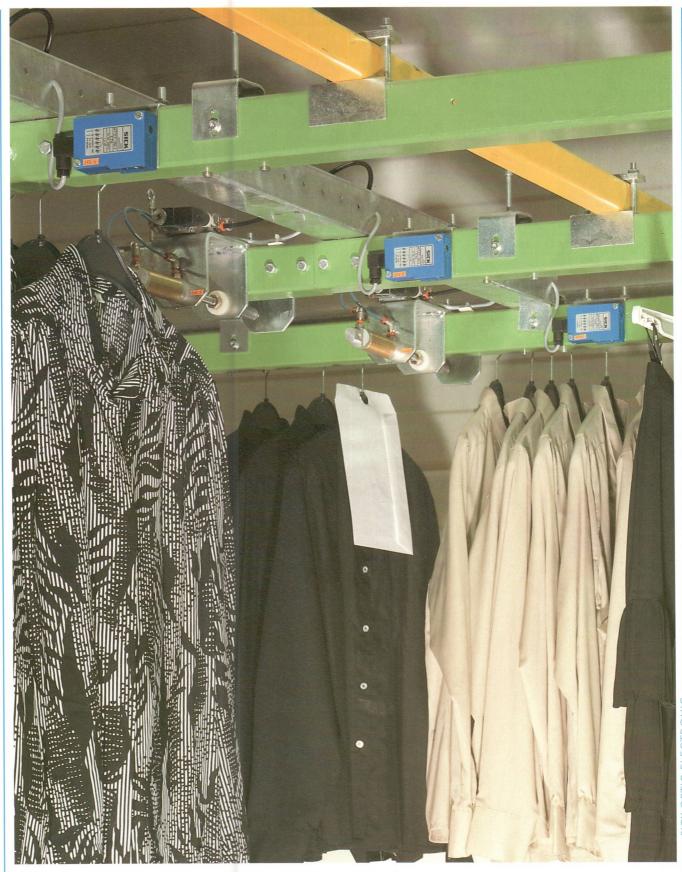
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# **Photoelectric Proximity Switch**

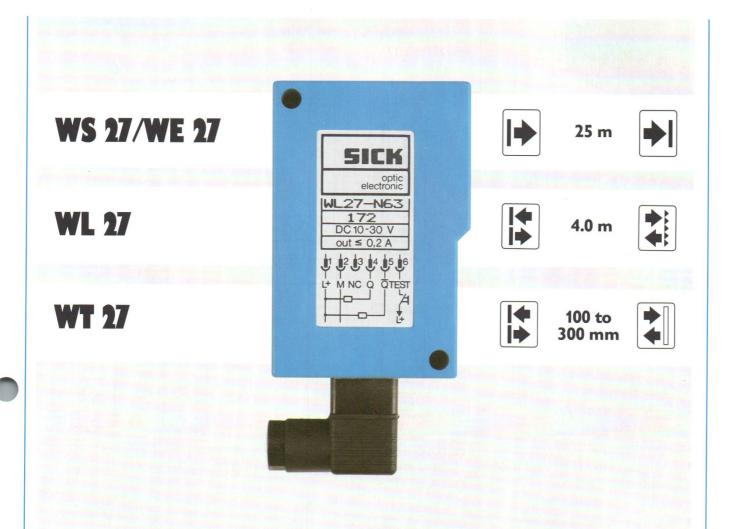
WT I8	-N 112	-N 610	-P 112	-P 410	-P 610			
Part No.	1005 682	1006381	1005 681	1010817	1006380			
Type of connection	cable	6-pin plug	cable	4-pin plug	6-pin plug			
Cable receptacle, Part No.		page 150		page 150	page 150			
Mounting bracket, Part No.	2009 317							
Scanning distance, adjustable	50 to 150 mn	n						
Range <sup>1</sup> ) with background suppression	20 to 50/20 to 150 mm							
Supply voltage V <sub>S</sub>	10 to 30 VDC <sup>2</sup> )							
Current consumption (no load)	≦50 mA							
Ripple <sup>3</sup> )	≤5 V <sub>pp</sub>							
Light source	LED, modulated infrared, average service life 100,000 h <sup>4</sup> )							
Light spot diameter	approx. 5 mm at a distance of 150 mm							
Switching outputs Q and Q	NPN PNP							
Signal voltage HIGH	approx. V <sub>S</sub>		$V_{S} - ( \le 1.5 \text{ V})$					
Signal voltage LOW <sup>5</sup> )	≤1.5 V		approx. 0 V					
Output current max.	200 mA							
Response time <sup>6</sup> ); switching frequency <sup>7</sup> )	≤ 700 μs; max.	. 700/s						
Enclosure rating	IP 67	IP 65	IP 67	IP 65	IP 65			
Circuit protection <sup>8</sup> )	A, B, C							
Ambient operating temperature <sup>9</sup> )	−25 to +55°C							
Storage temperature <sup>9</sup> )	-40 to +75°C							
Connecting cable	2 m	-	2 m	_				
Weight	approx. 100 g							

<sup>1)</sup> Object with 6 % reflectance (based on standard white, to DIN 5033)
2) Limit values
3) Must be within V<sub>s</sub> tolerances
4) At room temperature = +25 °C
5) At room temperature = +25 °C and output current of 100 mA

<sup>6)</sup> With resistive load
7) With light/dark time ratio of 1:1
8) A = supply connections reverse-polarity protected B = outputs Q and Q short circuit protected C = interference suppression
9) Do not distort cable below 0°C



# **W 27-Series** Photoelectric Switches with Extended Capabilities



Photoelectric switches in glassfiberreinforced plastic housings. Photoelectric proximity switches with continuously adjustable scanning distance and defined background suppression.

Polarizing filters on WL 27 photoelectric reflex switch.

With sensitivity control and blinking LED signal strength indicator to show misalignment and dirt build-up on optics. Through-beam photoelectric switch with output to signal dirt build-up.

Available with non-detachable cable enclosure rating IP 65.

Supply voltage from 10 to 30 V direct voltage (transistor output) or 24 to 240 V direct and alternating

voltage (relay output). Insensitive to ambient light through pulse modulation.

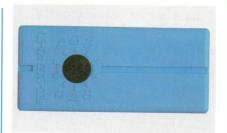
With test input to test sensor on demand from remote location.

Complementary switching outputs for light- and dark-switching modes.

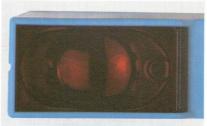
Direct-voltage version with two time ranges and time delay between 15 ms and 10 s (not on WL 27-F 132 and WT 27-F 112); universalvoltage version 0.5 to 10 s (not on WT 27-S 112).

Transistor outputs short circuit protected in NPN or PNP versions.

Available as through-beam photoelectric switches, photoelectric reflex switches and photoelectric proximity switches.



Choice of time delay between 15 ms and 10s on direct-voltage version.



Alignment sight and signal strength indicator at front facilitate adjustment. | 69

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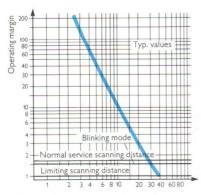


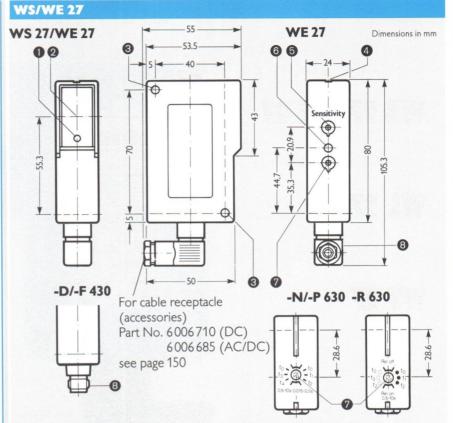
25 m



#### **Features**

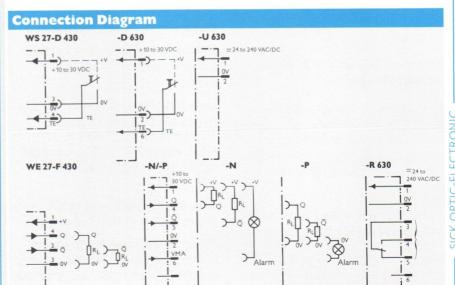
- Blinking LED signal strength indicator to show misalignment and dirt build-up on optics
- Output to signal dirt build-up (N and P versions)
- Supply connections reversepolarity protected
- Adjustable sensitivity
- Transistor outputs NPN or PNP, short circuit protected
- Insensitive to ambient light
- Switch-selectable time delay
- Test input to test sensor on demand from remote location (WS 27-D 630)
- No false triggering on power-up
- Glassfiber-reinforced plastic housing





- Power indicator (WS) Signal strength indicator (WE)
- 2 Center of optical axis
- 3 Mounting holes, I.D. 5.2 mm
- 4 Alignment sight
- Sensitivity control (WE), 270°- potentiometer
- 6 Signal strength indicator (WE)
- 7 Time control (WE), 270°-potentiometer Time-delay selector switch for DC; time-delay and light/dark selector for AC/DC.
- 8 Plug

For mounting bracket (accessories), Part No. 2009 122, see page 147.



## WS 27/WE 27

# **Through-beam Photoelectric Switch**

Model W\$ 27/WE 27	WS 27 Se -D 430	nder -D 630	-U 630	WE 27 Re -F 430	ceiver -N 630	-P 630	-R 630
Part No.				1010912	1010913	1010914	1010917
Type of connection	4-pin plug	6-pin plug		4-pin plug	4-pin plug	10.07.1	1010711
Cable receptacle, Part No.			6006685	6007302/	6006710		6006685
Mounting bracket, Part No.	2009122						
Scanning range	0 to 25 m						
Supply voltage V <sub>S</sub>	10 to 30 VI	10 to 30 VDC <sup>1</sup> ) 24 to		10 to 30 VD	'DC <sup>1</sup> )		24 to 240 VAC/DC
Current consumption (no load) / Power cons.	≤40 mA ≤2 VA :		≤ 40 mA	40 mA ≤35 mA			
Ripple <sup>3)</sup>	≤5 V <sub>pp</sub> -		≦5 V <sub>pp</sub>	≦5 V <sub>pp</sub>			
Light source	IR LED, modulated, 100,000 h <sup>4</sup> )		-	PP			
Light spot diameter	appr.1200 mm at a distance of 25 m						
Angle of dispersion/angle of reception	approx. 3°						
Switching outputs			PNP,Q+Q	NPN,Q+Ō	PNP,O+Ō	SPDT, floating <sup>5</sup>	
Signal voltage HIGH/switching voltage max.					V <sub>S</sub> -(≦1.5)		
Signal voltage LOW <sup>6)</sup> /switching current max.				approx. 0V		approx. 0V	
Output current max./switching power max.	_			200 mA			150 VA
Response time; switching frequency <sup>7</sup> )	_			≤ 500 jus <sup>8)</sup> ; max. 1000/s			6 ms; max. 10/s
Pull-up resistance			10 kΩ		10 kΩ		
Pull-down resistance	-		_	10 kΩ			
Time delay	- 200				switch-selec	ctable	
Switch position t <sub>0</sub>			2	no time del			
Switch position t <sub>1</sub> (or t <sub>3</sub> )	-				delay from leading edge of object		
Switch position t <sub>2</sub> (or t <sub>4</sub> )					delay from		
Time delays					0.015 to 0.3 or 0.5 to 10 s 0.5 to 10		
Adjustable with	-1000			-/	270°-pot. and mode selec. switch		
Test input <sup>9)</sup>	light source	disconnect	ted				
Input resistance	22 kΩ						
Light source ON	test input to	V <sub>S</sub> or not	connected				
Light source OFF	test input to	VOV					
Output to signal dirt build-up: VMA <sup>10)</sup>					NPN <sup>11)</sup>	PNP <sup>11</sup> )	
Internal resistance					1.5 kΩ		
Switching output: with signal reserve ≥50%					LOW	HIGH	211/1/11
Switching output: with signal reserve < 50%		leda exer			LOW <sup>12</sup> )	HIGH <sup>12</sup> )	
Enclosure rating	IP 65				Talkers.		
Circuit protection <sup>13)</sup>	A, B, C A		A, B, C			С	
Ambient operating temperature	-25 to +55	°C					
Storage temperature	−40 to +70°C						
Weight	approx. 100 g						
1) Limit values 2) +10%, -25% 3) Must be within V <sub>s</sub> tolerances 4) At room temperature = +25°C 5) Provide suitable arc suppression with inductive or capacitive loads	6) At room temperature = +25 °C and output current of 100 mA 7) With light/dark time ratio of 1:1; no time delay 8) With resistive load 9) Only WS 27-D 630 10) Only WS 27-N 630 and WS 27-P 630  11) Open collector 12) Switching to +V (NPN) or 0 V (PNP) periodically at 5 Hz 13) A = supply connections reverse-polarity protected B = outputs Q and Q and VMA short circuit protect C = interference suppression				larity protected		

Available on Request for Low Temperatures (down to -40°C)

for 10 to 30 VDC WE 27-N 6301 Part No. 1010 915 WE 27-P 6301 Part No. 1010 916



#### **Scanning Distance**

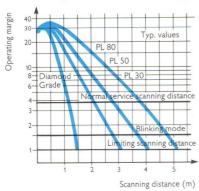


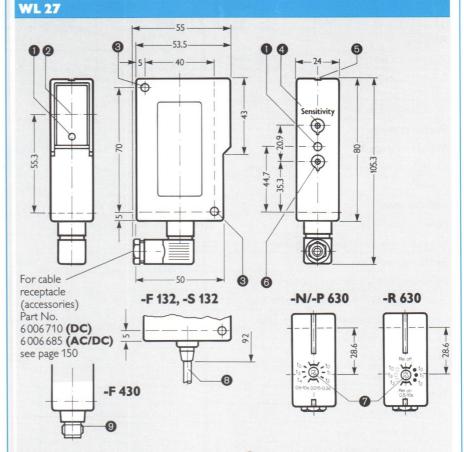
4.0 m



#### **Features**

- Polarizing filters, enabling objects even with reflecting surfaces to be detected
- Blinking LED indicator to show dirt build-up on optics
- Supply connections reversepolarity protected
- Complementary switching outputs Q and Q (light- and darkswitching) on WL 27-N, -P, -F
- Adjustable sensitivity (on WL 27-N, -P and -R)
- Transistor outputs short circuit protected, NPN or PNP
- Insensitive to ambient light
- Switch-selectable time delay
- Test input to test sensor on demand from remote location (WL 27-N, -P)
- No false triggering on power-up
- Glassfiber-reinforced plastic housing

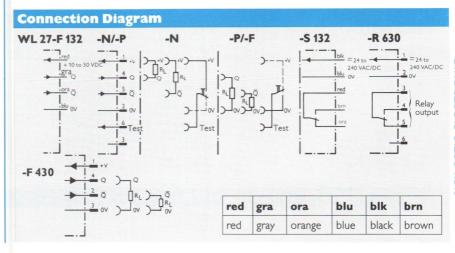




- Signal strength indicator
- 2 Center of optical axis
- 3 Mounting holes, I.D. 5.2 mm
- 4 Sensitivity control (on WL 27-N, -P and -R)
- 6 Alignment sight

- **6** Time control 0.5 to 10 s (on WL 27-N, -P and -R)
- Time-delay selector switch for DC; time-delay and light/dark selector for AC/DC (not on WL 27-S)
- 8 Connecting cable (on WL 27-F 132, -S 132)
- **9** Connector

For mounting bracket (accessories), Part No. 2009 122, see page 147. For reflectors (accessories), see page 144.



# **WL 27 Photoelectric Reflex Switch**

WL 27	-F132	-F 430	-P 630	-N 630	-R 630	-S 132
Part No.	1 006 376	1010443	1 005 806	1 005 805	1 005 804	1 006 37
Type of connection	cable	plug con. 4-pin	plug connecte	or 6-pin		cable
Cable receptacle, Part No.	-	6 007 302/ 6 007 303	6 006 710	6 006 685		
Mounting bracket, Part No.	2 009 122					
Scanning range						
With PL 80 reflector	Part No. 100	3 865 0 to 4.0 m				
With C 110 reflector	Part No. 530	0 to 3.4 m	1			
With PL 50 reflector	Part No. 100	0132 0 to 2.7 m	1			
With PL 30 reflector	Part No. 100	2314 0 to 2.0 m	n			
With "Diamond Grade" reflective tape	Part No. 401	9634 0 to 1.1 m	n			
Supply voltage V <sub>S</sub>	10 to 30 VD0	C <sup>1</sup> )			24to 240 VAC (+10%; -25%	
Current consumption <sup>2)</sup> /power cons.	≤ 50 mA				≦2 VA	
Ripple <sup>3)</sup>	≤5 V <sub>pp</sub>					
Light source	LED, visible r	red light, modulated	, average servi	ce life 100,000 h <sup>4)</sup>		
Light spot diameter	approx. 40 m	nm at a distance of 2	.7 m			
Switching outputs	PNP, Q and $\overline{Q}$ NPN, Q and $\overline{Q}$				SPDT, isolated <sup>5)</sup>	
Signal voltage HIGH/switching voltage max.	$V_S - (\leq 1.5 \text{ V})$ approx. $V_S$				250 VAC	
Signal voltage LOW <sup>6)</sup> /switching current max.	approx. 0 V ≦1.5 V				2.5 A	
Output current max./switching power max.	200 mA				150 VA	
Pull-up resistance				10 kΩ		
Pull-down resistance		10 kΩ		_		
Response time <sup>7)</sup> ; switching frequency <sup>8)</sup>	≤ 500 μs; ma	x. 1000/s			max. 6 ms; max	ax. 10/s
Time delay			switch-selecta	able		2000
Switch position t <sub>0</sub>	_		no time delay	ime delay		
Switch position t <sub>1</sub> (or t <sub>3</sub> )	- 100			ading edge of object	t	_
Switch position t <sub>2</sub> (or t <sub>4</sub> )				ailing edge of object		_
Time delays				or 0.5 to 10 s	0.5 to 10 s	2000
Test input			light source d	eactivated	_	
Input resistance			15 kΩ	22 kΩ	_	
Light source ON test input to			V <sub>s</sub>	0 V		
Light source OFF test input to			0 V	V <sub>s</sub>	_	
Enclosure rating	IP 65					
Circuit protection <sup>9)</sup>	A, B, C				С	
Ambient operating temperature <sup>10)</sup>	-25  to  +55	°C				
Storage temperature <sup>10)</sup>	$-40 \text{ to } +70^{\circ}$					
Connecting cable	11)					11)
Weight	approx. 100 g	2				
1) Limit values 2) No load	6) At room tem	perature = + 25°C urrent of 100 mA		9) A = supply conne B = outputs O ar	ections reverse-pola nd Q short-circuit p	arity protected

#### Available on Request for Low Temperatures (down to -40°C)

for 10 to 30 VDC with cable	WL 27-F1321 Part No. 1 010 015	
for 10 to 30 VDC with plug	WL 27-P6301 Part No. 1010018	WL 27-N6301 Part No. 1010017

<sup>25</sup> No load
3) Must be within V<sub>s</sub> tolerances
4) At room temperature = +25 °C
5) Provide suitable arc suppression with inductive or capacitive loads

and output current of 100 mA

7) With resistive load

8) With light/dark time ratio of 1:1, no time delay

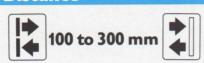
B = outputs Q and Q short-circuit protected C = interference suppression

10) Do not distort cable below 0°C

11) 2 m, 4 × 0.25 mm<sup>2</sup>, PVC, O.D. 5 mm

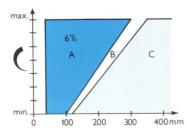


#### **Adjustable Scanning** Distance



#### **Features**

- Scanning distance continuously adjustable
- Background suppression
- Blinking LED signal strength indicator to show dirt build-up on optics
- Supply connections reversepolarity protected
- Switching outputs light- and darkswitching
- Transistor outputs PNP or NPN, short circuit protected
- Insensitive to ambient light
- Switch-selectable time delay (not on WT 27-F and -S)
- Test input to test sensor on demand from remote location (not on WT 27-F, -S and -R)
- No false triggering on power-up
- Glassfiber-reinforced plastic housing



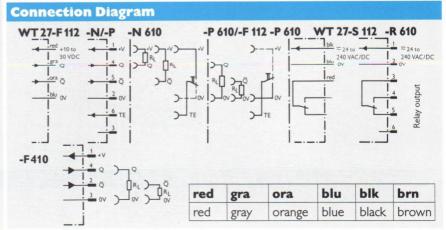
Background suppression

A = scanning range B = background suppression range C = background

- **WT 27** Dimensions in mm 0 6 35.3 0 30 ( 44.7 Ф For cable receptacle (accessories)
  Part No.
  6006710 (DC)
  6006685 (AC/DC) -N/P -F 112, -S 112 28.6 see page 150 28.6 -F 410
- Signal strength indicator
- 2 Direction of movement of object being scanned
- 3 Center of optical axis
- 4 Mounting holes, I.D. 5.2 mm
- Scanning distance control
- 6 Alignment sight

- Time control (on WT 27-N, -P and -R)
- Time-delay switch for DC; time-delay and light/dark selector for AC/DC
- Connecting cable
- Connector

For mounting bracket (accessories), Part No. 2009 122, see page 147.



# **Photoelectric Proximity Switch**

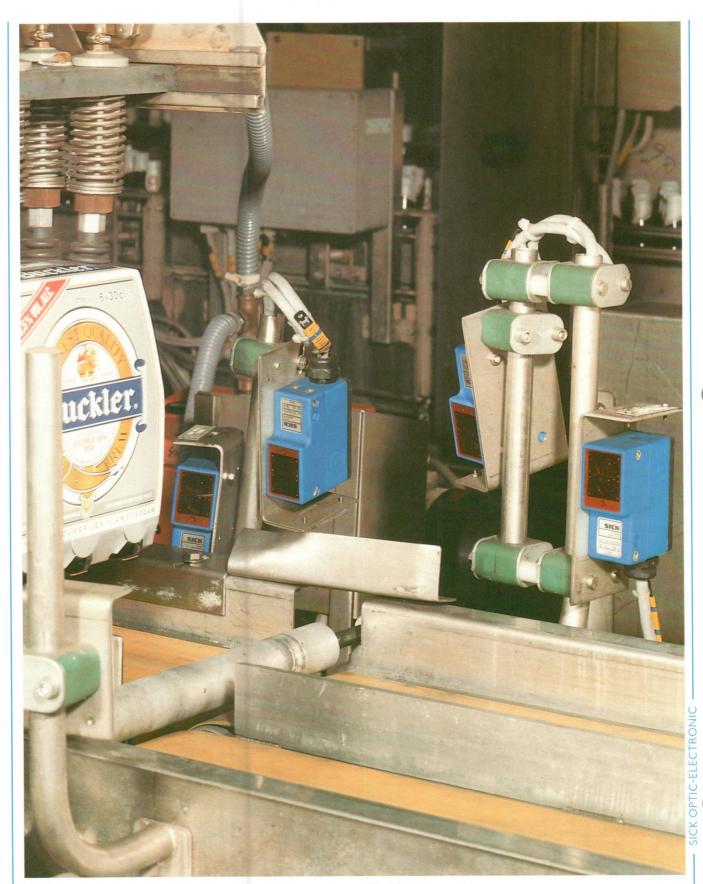
WT 27	-F112	-F 410	-P610	-N610	-R610	-\$112
Part No.	1 006 378	1010444	1 005 803	1 005 802	1 005 801	1 006 377
Type of connection	cable	plug con. 4-pin	plug connect	or 6-pin		cable
Cable receptacle, Part No.		6007302/ 6007303	6006710		6006685	
Mounting bracket, Part No.	2009122					
Scanning distance, adjustable	100 to 300 m	nm				
Scanning range <sup>1)</sup> with background suppress.	30 to 100/30	to 300 mm				
Supply voltage V <sub>S</sub>	10 to 30 VD	C <sup>2</sup> )		24 to 240 VA (+10%, -25%		
Current consumption <sup>3)</sup> /power cons.	< 50 mA				≦2 VA	
Ripple <sup>4)</sup>	≤5 V <sub>pp</sub>					
Light source		, modulated, averag	ge service life 1	00,000 h <sup>5)</sup>		
Light spot diameter	approx. 10 m	m at a distance of 3	00 mm			
Switching outputs	PNP, Q and i	Q		NPN, Q and Q	SPDT, isolated	
Signal voltage HIGH/switching voltage max.	$V_S - (\leq 1.5 \text{V})$ approx. $V_S$				250 VAC	
Signal voltage LOW <sup>6)</sup> /switching current max.	approx. 0 V ≤1.5 V				2.5 A	
Output current max./switching power max.	200 mA				150 VA	
Pull-up resistance	10 kΩ					
Pull-down resistance			10 kΩ			
Response time <sup>7)</sup> ; switching frequency <sup>8)</sup>	max. 2 ms; m	ax. 250/s			max. 6 ms; m	ax. 10/s
Time delay <sup>9)</sup>	-43		switch-selecta	able		
Switch position t <sub>0</sub>	-		no time delay	,		
Switch position t <sub>1</sub> (or t <sub>3</sub> )			delay from tra	ailing edge of object		
Switch position t <sub>2</sub> (or t <sub>4</sub> )			delay from le	ading edge of object	-	
Time delays			0.015 to 0.3 s	s or 0.5 to 10 s	0.5 to 10 s	
Test input <sup>10)</sup>			light source d	eactivated		
Input resistance			22 kΩ			
Light source ON test input to			Vs	0 V		
Light source OFF test input to			0 V	Vs		
Enclosure rating	IP 65					
Circuit protection <sup>11)</sup>	A, B, C				С	
Ambient operating temperature <sup>12)</sup>	$-25 \text{ to } +55^{\circ}$	C				
Storage temperature <sup>12)</sup>	$-40 \text{ to } +75^{\circ}$	C				
Connecting cable	13)					13)
Weight	approx. 100 g					
1) Object with 6% reflectance	9) \M/ith light/da	rk time mtie of 1:1				

Available on Request for Low Temperatures (down to -40°C)

for 10 to 30 VDC with cable	WT 27-F1121 Part No. 1010020	
for 10 to 30 VDC with plug	WT 27-P6101 Part No. 1010023	WT 27-N6101 Part No. 1 010 022

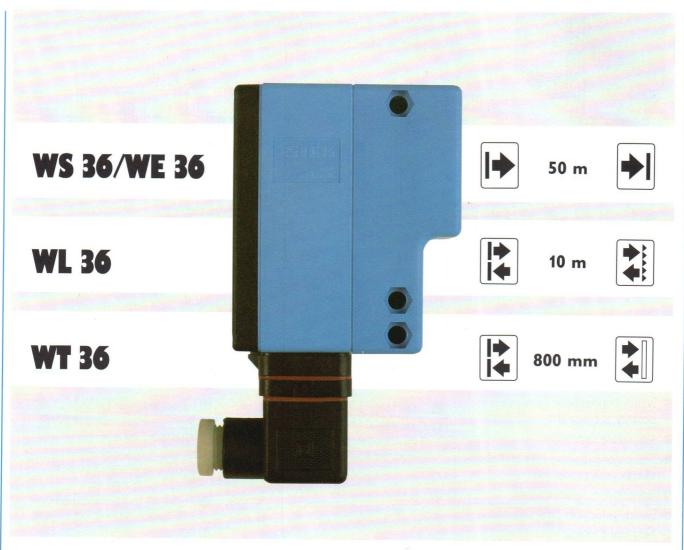
<sup>1)</sup> Object with 6% reflectance (based on white standard, to DIN 5033)
2) Limit value
3) No load
4) Must be within V<sub>s</sub> tolerances
5) At room temperature = +25 °C
6) At room temperature = +25 °C
and output current of 100 mA
7) With resistive load

<sup>8)</sup> With light/dark time ratio of 1:1
9) Only WT 27-N, -P and -R
10) Only WT 27-N and -P
11) A = supply connections reverse-polarity protected
B = outputs Q and Q short-circuit protected
C = interference suppression
12) Do not distort cable below 0°C
13) 2 m, 4 x 0.25 mm², PVC, O.D. 5 mm



76 WT 36 photoelectric proximity switches controlling the presence of bottles in six-packs

# W 36-Series Heavy-duty Photoelectric Switches



Photoelectric switches in glassfiber-reinforced plastic housings. Photoelectric reflex switches with polarizing filters; photoelectric proximity switches with adjustable scanning distance and defined background suppression.

Through-beam photoelectric switch with long scanning distance.

With sensitivity control and blinking LED signal strength indicator to show misalignment and dirt build-up on optics.

With terminal chamber (cable gland PG 13.5) conforming to IP 67 (dusttight, watertight); also available with plug to IP 65 (dusttight, waterproof).

Supply voltage from 10 to 30 V direct voltage (transistor output) or 24 to 240 V direct and alternating voltage (relay output).

Insensitive to ambient light through pulse modulation.

Transistor outputs for NPN and PNP mode, short circuit protected. Switchable to <u>light- or dark-</u>switching.

With time delay between 20 ms and 1 s; universal-voltage version 0.5 to 12 s.

Available as through-beam photoelectric switch, photoelectric reflex switch and photoelectric proximity switch.



Terminal chamber permits individual wiring.



Controls for time delay, switching mode and sensitivity.

SICK OPTIC-ELECTRONIC



#### **Scanning Distance**

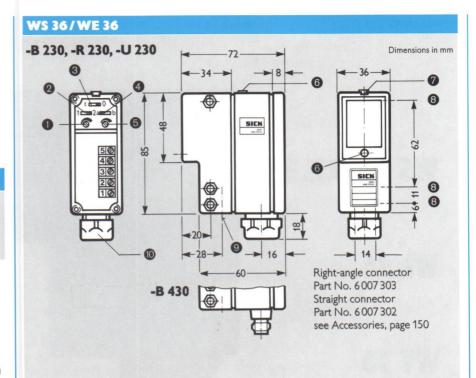


50 m

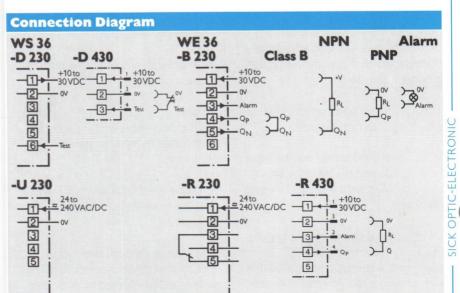


#### **Features**

- Blinking LED signal strength indicator to show misalignment and dirt build-up on optics
- Output to signal dirt build-up (on WE 36-B)
- Supply connections reversepolarity protected
- Adjustable sensitivity
- Transistor outputs NPN and PNP, short circuit protected
- Insensitive to ambient light
- Switch-selectable time delay
- Test input to test sensor on demand from remote location (not on WS 36-U)
- No false triggering on power-up
- Choice of light/dark switching
- Direct and alternating voltage supply
- Glassfiber-reinforced plastic housing



- 1 Time control, 270°-potentiometer
- 2 Time delay 1 from trailing edge of object 2 from leading edge of object
- 3 Time delay ON (t) and OFF (0)
- 4 Light/dark selector a = light-switching b = dark-switching
- 5 Sensitivity control, 270°-potentiometer
- 6 Power indicator (WS) Signal strength indicator (WE)
- Alignment sight
- 8 Mounting holes through enclosure, recessed on both sides for M5 hex nut
- 9 Threaded mounting holes M5, 5.5 mm deep
- PG 11 cable gland (for cable diameter 5 to 12 mm)



# Through-beam photoelectric switch WS 36/WE 36

WS 36/WE 36	WS 36 Sender		WE 36 Receiver			
Model	-D 230	-D 430	-U 230	-B 230	-B 430	-R 230
Part No.				1010922	1011107	1010978
Type of connection $(T/P)^1$ )	Т	P, 4-pin	Т	Т	P, 4-pin	T
Cable receptacle, Part No.	=	6007 302 6007 303			6007302 6007303	
Mounting bracket, Part No.	2005806				1000,000	
Scanning distance	50 m					
Supply voltage V <sub>S</sub>	10 to 30 V	DC <sup>2</sup> )	24 to 240 VAC/DC <sup>3</sup> )	10 to 30 V	DC <sup>2</sup> )	24 to 240 VAC/DC <sup>3</sup> )
Current consumption/power consumption	<40 mA		<2 VA	<40 mA		<2 VA
Ripple <sup>4</sup> )	≦5 V <sub>pp</sub>			≤5 V <sub>pp</sub>		
Light source		ed, modula	ted, average service life			
Light spot diameter	approx. 13	00 mm at a	distance of 25 m			
Switching outputs <sup>6</sup> )				PNP/NPN		SPDT, isolated <sup>7</sup> )
Signal voltage HIGH/switching voltage max.	- 1			$+V_S-(\leq 1.5)^8)$		250 VAC
Signal voltage LOW <sup>9</sup> )/switching current max.		_				3 A
Output current max./switching power max.		-				500 VA
Response time <sup>11</sup> ), switching frequency max. <sup>12</sup> )	_	-			-00/s	≦20 ms; 10/s
Time delay					ctable	
Switch position 1 2	_			delay from trailing edge of object delay from leading edge of object		
Time delays	-			0.02 to 1 s		0.5 to 12 s
Alarm output	-	1		dirt build-up signalling		
PNP output with current limitation	_			open collector/1.5 kΩ		
"Sufficient" light received (signal reserve ≥50%)				output HIC (V <sub>S</sub> –1.5 V		
"Insufficient" light received	-			switching to ically at 5 H	01	
Test input	sender dea	ctivated	_			
Internal resistance	15 kΩ					
Light source "active" V <sub>TEST</sub>	+V <sub>S</sub> or not connec	ted	-			
Light source "inactive" V <sub>TEST</sub>	0V					
Enclosure rating	IP 67		IP 67	IP 67		IP 67
Circuit protection <sup>13</sup> )	Α			A, B, C		-
Ambient operating temperature <sup>14</sup> )	-25  to  +5	5°C				
Storage temperature <sup>14</sup> )	-40  to  +7	0°C				
Weight	approx. 160	approx. 160 g				
1) T = terminal chamber; P = plug connector	10) PNP outpu	0) PNP output: +0.1 V				

<sup>1)</sup> T = terminal chamber; P = plug connector
2) Limit values
3) +10%, -25%
4) Must be within V<sub>5</sub> tolerances
5) At room temperature = +25°C
6) Referred to switch position a: with uninterrupted beam HIGH, with interrupted beam LOW
7) Provide suitable arc suppression with inductive or capacitive loads
8) NPN output: +V<sub>5</sub>
9) At room temperature = +25°C and output current of 100 mA

<sup>10)</sup> PNP output: +0.1 V
11) With resistive load
12) With light/dark time ratio of 1:1; no time delay
13) A = supply connections reverse-polarity protected
B = outputs Q<sub>N</sub> and Q<sub>P</sub> short circuit protected
C = interference suppression
14) Do not distort cable below 0°C



#### **Scanning Distance**

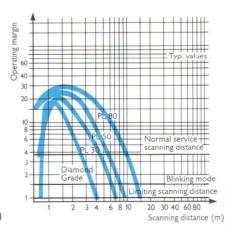


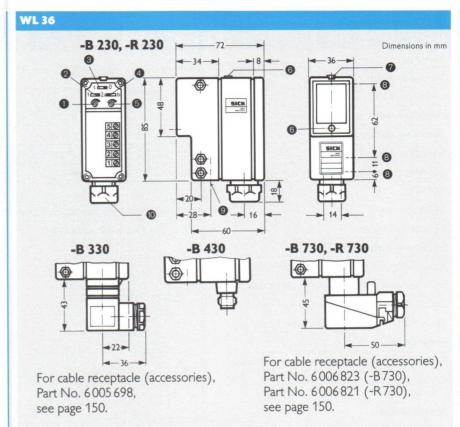
10 m



#### **Features**

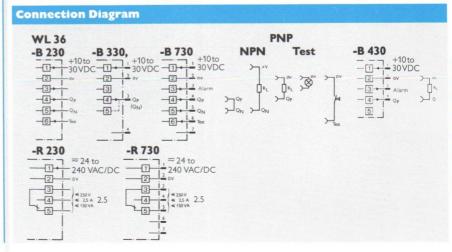
- Polarizing filters, enabling objects even with reflecting surfaces to be detected
- Blinking LED signal strength indicator to show dirt build-up on optics
- Supply connections reversepolarity protected
- Choice of light/dark switching
- Adjustable sensitivity
- Transistor outputs short circuit protected, NPN or PNP
- Insensitive to ambient light
- Switch-selectable time delay
- Test input to test sensor on demand from remote location (on WL 36-B)
- No false triggering on power-up
- Direct and alternating voltage supply (WL 36-R)
- Glassfiber-reinforced plastic housing





- 1 Time control, 270°-potentiometer
- Time delay1 from trailing edge of object2 from leading edge of object
- 3 Time delay ON (t) / OFF (0)
- Light/dark selector
   a = light-switching
   b = dark-switching
- **5** Sensitivity control, 270°- potentiometer
- 6 Signal strength indicator at front and top
- Alignment sight
- **3** Mounting holes through enclosure, recessed on both sides for M5 hex nut
- **9** Threaded mounting holes M5, 5.5 mm deep
- PG 11 cable gland (for cable diameter 5 to 12 mm)

For mounting bracket (accessories), Part No. 2005 806, see page 147. For reflectors (accessories), see page 144.



## **Photoelectric Reflex Switch**

WL 36	-B 230	-B 430	-B 730	-B 330	-R 230	-R 730	
Part No.	1005 385	1010612	1008 848	1005 787	1005 387	1008 849	
Type of connection (T/P) <sup>1</sup> )	T	P, 4-pin	P, 7-pin	P, 3-pin	T	P, 7-pin	
Cable receptacle, Part No.		6007 302 6007 303	6006 823	6005 698	-	6006 821	
Mounting bracket, Part No.	2005 806						
Scanning range							
With PL 80 reflector	Part No. 10	003 865	0.1 to 10	m			
With C 110 reflector	Part No. 53	04549	0.3 to 9	m			
With PL 50 reflector	Part No. 10	000132	0.1 to 6.5	m			
With PL 30 reflector	Part No. 10	02314	0.1 to 5	m			
With "Diamond Grade" reflective tape	Part No. 40	19634	0.25 to 3 m	(min. 200 x 2	200 mm <sup>2</sup> area	)	
Supply voltage V <sub>S</sub>	10 to 30 VI	$C^2$ )				/AC/DC (+10%, -25%)	
Current consumption/power consumption	< 40 mA				≦2 VA	, , ,	
Ripple <sup>3</sup> )	< 5 V <sub>pp</sub>						
Light source		red light, mo	dulated, averag	:100.000 h <sup>4</sup> )			
Light spot diameter	approx. 50 mm at a distance of 3 m						
Switching outputs <sup>5</sup> )	PNP/NPN PNP PNP/NPN				SPDT, isolated <sup>6</sup> )		
Signal voltage HIGH/switching voltage max.	$V_S - (\leq 1.5)^7$				250 VAC		
Signal voltage LOW <sup>8</sup> )/switching current max.	≤1.5 V <sup>9</sup> )				3 A		
Output current max./switching power max.	200 mA				500 VA		
Response time <sup>10</sup> )	≤1.25 ms <sup>11</sup>	)			< 20 ms		
Switching frequency max. <sup>12</sup> )	400/s				10/s		
Time delay	switch-selec	table					
Switch position 1/2	delay from t	trailing edge o	f object / delay	from leading	edge of object	+	
Time delays	0.02 to 1 s	0 0			0.5 to 12 s		
Alarm output	PNP, open	collector					
Internal resistance	≥1.5 kΩ±						
"Sufficient" light received (signal reserve ≧ 50%)	output HIG	H (V <sub>S</sub> -1.5 V)	)				
"Insufficient" light received	switching to	V <sub>S</sub> periodical	y at 5 Hz	1-			
Test input			switching to	) V			
nternal resistance	≥15 kΩ						
Enclosure rating	IP 67	IP 67			IP 67	IP 65	
Circuit protection <sup>13</sup> )	A, B, C				-	1 03	
Ambient operating temperature <sup>14</sup> )	-25  to  +55	5°C					
Storage temperature <sup>14</sup> )	-40  to  +70						
Weight	165 g						

<sup>1)</sup> T = terminal chamber, P = plug connector
2) Limit values
3) Must be within V<sub>s</sub> tolerances
4) At room temperature = +25°C
5) Referred to switch position a:
with uninterrupted beam HIGH,
with interrupted beam LOW
6) Provide suitable arc suppression with inductive
or capacitive loads
7) NPN output: +V<sub>s</sub>
8) At room temperature = +25°C
and output current of 100 mA
9) PNP output: +0.1 V

<sup>10)</sup> No time delay
11) With resistive load
12) With light/dark time ratio of 1:1; no time delay
13) A = supply connections reverse-polarity protected
B = outputs Qp and Qn short circuit protected
C = interference suppression
14) Do not distort cable below 0°C



#### Adjustable Scanning **Distance**



#### 200 to 800 mm



#### **Features**

- Continuously adjustable scanning distance
- Background suppression
- Blinking LED signal strength indicator to show misalignment and dirt build-up on optics
- Supply connections reversepolarity protected
- Light/dark switching by complementary outputs Q and  $\overline{Q}$ (WT 36-N, -P), or switchselectable (WT 36-R)
- Transistor outputs short circuit protected
- Insensitive to ambient light
- Switch-selectable time delay
- Test input (not on WT 36-R)
- No false triggering on power-up
- Direct and alternating-voltage supply (WT 36-R)
- Glassfiber-reinforced plastic housing

Selector switch:

for AC/DC

time delay for DC

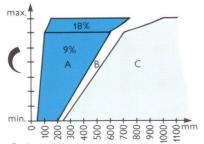
4 Center of optical axis

time delay and light/dark selection

2 Scanning distance control, approx.

3 Time control, 270°-potentiometer

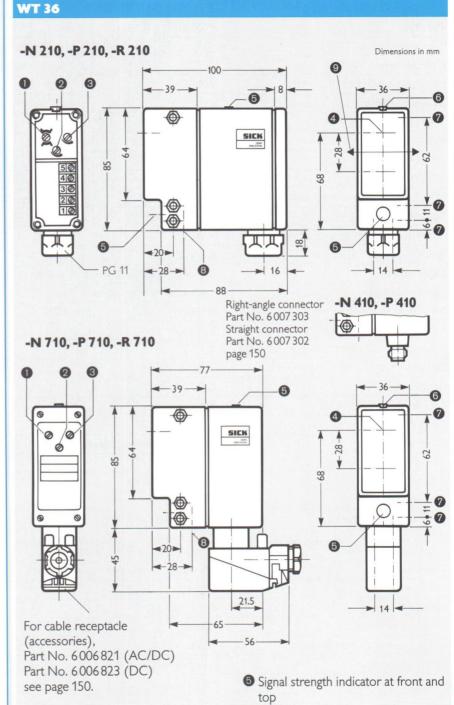
21/2 turns from min. to max.



Background suppression

- A = scanning range
- B = background suppression range
- C = background

82



6 Alignment sight

5.5 mm deep

being scanned

For mounting bracket (accessories), Part No. 2005 806, see page 147.

Mounting holes through enclosure,

8 Threaded mounting holes M5,

9 Direction of movement of object

recessed on both sides for M5 hex

# **Photoelectric Proximity Switch**

WT 36	-N 210	-N 710	-N 410	-P 210	-P 710	-P 410	-R 210	-R710
Part No.	1010109	1006370	1011109	1010108	1006 047	1011108	1010110	1005 927
Type of connection (T/P) <sup>1)</sup>	T	P, 7-pin	P, 4-pin	T	P, 7-pin	P, 4-pin	T	P, 7-pin
Cable receptacle, Part No.		6006823	6007 302 6007 303		6006823	6007 302 6007 303		
Mounting bracket, Part No.	2005806					1 0007 303		
Scanning distance, adjustable	200 to 800	0 mm						
Scanning range with background suppression	see diagra	m						
Supply voltage V <sub>S</sub>	10 to 30 V	/DC <sup>2)</sup>					24 to 240	VAC/DC <sup>3</sup>
Current consumption/power consumption	≦50 mA						≦2 VA	
Ripple <sup>4)</sup>	≤5 V <sub>pp</sub>							
Light source		LED, infrared, modulated, average service life 100,000 h <sup>5</sup> )						
Light spot diameter	approx. 15	approx. 15 mm at a distance of 800 mm						
Switching outputs	NPN, Q+	- Q		PNP,Q+0	2		SPDT, isolated <sup>6)</sup>	
Signal voltage HIGH/switching voltage max.	approx. V				250 VAC			
Signal voltage LOW <sup>7)</sup> /switch, current max.	≦1.5 V			approx.0V			2.5 A	
Output current max./switch. power max.	200 mA						150 VA	
Response time <sup>8)</sup>	≦2 ms						≦6 ms	
Switching frequency max. <sup>9)</sup>	250/s						10/s	
Time delay	switch-sele	ectable						
Switch position t <sub>0</sub>	no time de	elay				686666		
Switch position t <sub>1</sub> (or t <sub>3</sub> )	delay from	trailing edge	e of object		Barrier Till			
Switch position t <sub>2</sub> (or t <sub>4</sub> )	delay from	leading edg	e of object					
Time delays	t <sub>1</sub> , t <sub>2</sub> : 0.015	to 0.3 s; t <sub>3</sub> ,	, t <sub>4</sub> : 0.5 to 12	2 s			0.5 to 12 s	
Test input	light source	e deactivated	d				-	
Internal resistance	≥ 22 kΩ							
Enclosure rating	IP 67	IP 65	IP 67	IP 67	IP 65	IP 67	IP 67	IP 65
Circuit protection <sup>10)</sup>	A, B, C						_	00
Ambient operating temperature <sup>11)</sup>	-25  to  +5	55°C						
Storage temperature <sup>11)</sup>	-40  to  +7	′0°C						
Weight	approx. 200 g							
1) T = terminal chamber; P = plug connector	6) Provide suitable arc suppression with inductive 9) With light/dark time ratio of 1.1; no time delay					me delay		

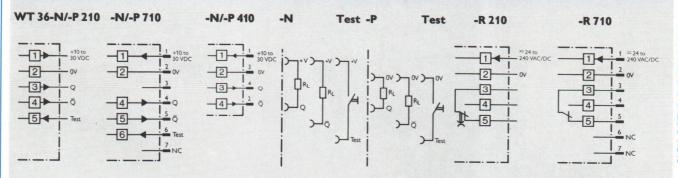
- 2) Limit value
  3) +10%, -25%
  4) Must be within V<sub>s</sub> tolerances
  5) At room temperature = +25°C

- or capacitive loads

  7) At room temperature = +25°C
  and output current of 100 mA

  8) With resistive load
- 9) With light/dark time ratio of 1:1; no time delay
  10) A = supply connections reverse-polarity protected
  B = outputs Q and Q short circuit protected
  C = interference suppression
  11) Do not distort cable below 0°C

#### **Connection Diagram**





84 WT 45 photoelectric proximity switch with cooler monitoring the paper web in extremely difficult conditions

## W 45-Series Photoelectric Switches



Photoelectric switches with <u>metal</u> <u>housing</u>. Photoelectric reflex switch with polarizing filters.

Photoelectric proximity switch with adjustable scanning distance and defined background suppression.

Through-beam photoelectric switch with built-in optical alignment facility.

With sensitivity control and blinking LED signal strength indicator to show misalignment and dirt build-up on optics.

With terminal chamber (cable gland PG 13.5) conforming to enclosure rating IP 67 (also available with 7-pin plug, to IP 65.

Supply voltage 10 to 60 V direct voltage (transistor output) or 24 to

240 V direct and alternating voltage (relay output).

Insensitive to ambient light through pulse modulation.

Transistor outputs available in NPN and PNP configurations, complementary for light- and dark-switching. In relay version, choice of light- and dark switching.

With time delay between 15 ms and 12 s; universal voltage version 0.5 to 12 s.

Transistor outputs short circuit protected.

Available as through-beam photoelectric switch, photoelectric reflex switch and photoelectric proximity switch.



Terminal chamber with controls for time delay and sensitivity.



Signal strength indicator and viewfinder facilitate adjustment.

· SICK OPTIC-ELECTRONIC



#### **Scanning Distance**

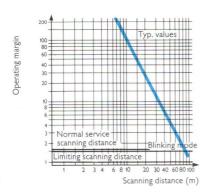


100 m



#### **Features**

- Optical alignment facility
- Output to signal dirt build-up (N and P versions)
- Status indicator in terminal chamber
- Supply connections reversepolarity protected
- Adjustable sensitivity
- Transistor outputs NPN and PNP, short-circuit protected
- Insensitive to ambient light
- Switch-selectable time delay
- Test input to test sensor on demand from remote location
- No false triggering on power-up
- Wide supply-voltage ranges for direct and universal voltage
- Lens heater
- Light- and dark-switching
- Glass sealing disk, 5 mm thick
- Metal housing



# Dimensions in mm With plug SICK 105 SICK For cable receptacle

**WE 45-R** 

SICK

**WE 45-N/P** 



- Eyepiece for alignment deviceSignal strength indicator at top
- Threaded mounting holes M6, 8 mm deep
- 4 Alignment sight
- 6 Signal strength indicator
- 6 Viewfinder objective lens
- 7 Light source (WS), light receiver (WE)

- **3** PG 13.5 cable gland (for cable diameter 7 to 15 mm)
- Time delay switch, on relay version with light/dark selection

(accessories), right angle,

and straight, Part No. 6006 612,

see page 150.

Part No. 6006 613,

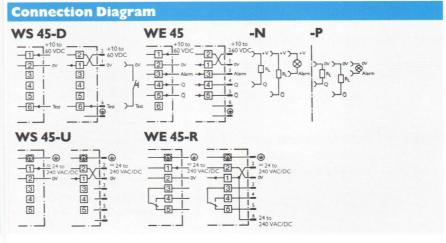
Sensitivity control

12

13

- 1 Time delay control
- 12 Terminal strip
- Status indicator

For mounting bracket (accessories), Part No. 2011 480, see page 147. For ball-joint bracket (accessories), Part No. 2011 436, see page 147. For dust shield (accessories), Part No. 2011 432, see page 152. For snow shield (accessories), Part No. 2011 431, see page 152. For cooling plate (accessories), Part No. 2011 435, see page 152.



# WS 45/WE 45

# **Through-beam Photoelectric Switch**

WS 45 / WE 45	WS 45 Sender WE 45 Receiver		iver			
Model	<b>-D 260</b> <sup>1</sup> )	-U 260	-N 260 <sup>1</sup> )	-P 260 <sup>1</sup> )	-R 260	
Part No.			1010 984	1010 985	1010 995	
Type of connection	terminal chaml	ber				
Mountig bracket, Part No.	2011 480					
Ball-joint bracket, Part No.	2011 436					
Scanning distance	100 m					
Supply voltage V <sub>S</sub>	10 to 60 VDC <sup>2</sup> )	24 to 240VAC/DC <sup>3</sup> )	10 to 60 VDC <sup>2</sup> )		24 to 240 VAC/DC <sup>3</sup> )	
Current consumption/power consumption <sup>4</sup> )	≦50/250 mA	<3 VA/6 VA	≤50 mA/≤250	) mA	≦3 VA/≦6 VA	
Ripple <sup>5</sup> )	≦5 V <sub>pp</sub>	-	≦5 V <sub>pp</sub>			
Light source		odulated, 100,000 h <sup>6</sup> )				
Light spot diameter	approx. 4 m at	a distance of 100 m	-			
Angle of dispersion/angle of reception	approx. 2.5°	approx. 2.5° approx. 1.2°				
Switching outputs			NPN, Q and Q	PNP, Q and Q	SPDT, isolated <sup>7</sup> )	
Signal voltage HIGH/switching voltage max.			approx. V <sub>S</sub>	$V_S - (\leq 2 V)$	250/120 V (AC/DC)	
Signal voltage LOW <sup>8</sup> )/switching current max.	- 11	_		approx. 0 V	4/2 A (AC/DC)	
Output current max./switching power max.			200 mA		750VA/120W (AC/DC	
Response time <sup>9</sup> ); switching frequency max. <sup>10</sup> )			≤500 µs; 1000/s	s	≤10 ms; 10/s	
Time delay			switch-selectable	е		
Switch position t <sub>0</sub>			no time delay			
Switch position t <sub>1</sub> or t <sub>3</sub>			delay from leading edge of object			
Switch position t <sub>2</sub> or t <sub>4</sub>	-		delay from trailing edge of object			
Time delays			0.015 to 0.3 s or 0.5 to 12 s		0.5 to 12 s	
Adjustable with			270°-potentiometer			
Alarm output			dirt build-up signalling			
Output/output current max.	_		open collector/100 mA			
"Sufficient" light received (signal reserve ≧50%)	_		output LOW	output HIGH	-	
"Insufficient" light received	-		switching period	ically at 5 Hz	- // // // // // // // // // // // // //	
Test input	light source deactivated					
Internal resistance	≥22 kΩ					
Enclosure rating	IP 67; with plug	IP 65				
Circuit protection <sup>11</sup> )	A	_	A, B, C			
Ambient operating temperature	-25 to +55°C	no cooling, to +12				
Storage temperature	-40 to +70°C					
Weight	approx. 800 g					
1) Special versions: see selection table 2) Limit values 3) +10%, -25% 4) Without(with lens heater	6) At room temper. 7) Provide suitable or capacitive load	arc suppression with indu	uctive 10) With	resistive load light/dark time ratio o supply connections rev	f1:1; no time delay erse-polarity protected	

<sup>4)</sup> Without/with lens heater 5) Must be within V<sub>S</sub> tolerances

with lens heater		with 7-pin plug, t	o DIN 43 651	with lens heater and 7-pin plug, to DIN 43 651		
WS 45-D 250	Part No. 1009731	WS 45-D 660	Part No. 1009732	WS 45-D 650	Part No. 1009 735	
WS 45-U 250	Part No. 1009730	WS 45-U 660	Part No. 1009733	WS 45-U 650	Part No. 1009734	
WE 45-N 250	Part No. 1009723	WE 45-N 660	Part No. 1009724	WE 45-N 650	Part No. 1009729	
WE 45-P 250	Part No. 1009722	WE 45-P 660	Part No. 1009725	WE 45-P 650	Part No. 1009728	
WE 45-R 250	Part No. 1009721	WE 45-R 660	Part No. 1009726	WE 45-R 650	Part No. 1009727	

<sup>8)</sup> At room temperature = +25 °C and output current of 100 mA

A = supply connections reverse-polarity protected B = outputs Q and  $\overline{Q}$  and "alarm" short circuit protected C = interference suppression



#### **Scanning Distance**

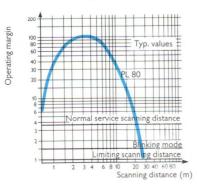


45 m



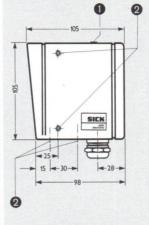
#### **Features**

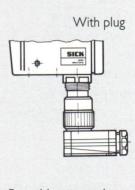
- Output to signal dirt build-up (N and P versions)
- Polarizing filter
- Status indicator in terminal chamber
- Supply connections reversepolarity protected
- Light- and dark-switching by complementary switching outputs Q and  $\overline{Q}$  (WL 45-N, -P), or switch-selectable (WL 45-R)
- Adjustable sensitivity
- Transistor outputs short circuit protected, NPN or PNP
- Insensitive to ambient light
- Switch-selectable time delay
- Test input (only WL 45-N/P)
- Wide supply voltage ranges for direct and alternating voltage
- No false triggering on power-up
- Glass sealing disk, 5 mm thick
- Metal housing



#### WL 45-N, -P, -R 260

#### WL 45-N 260, -P 260, -R 260



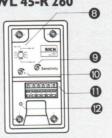


Dimensions in mm

WL 45-N 260, -P 260,



WL 45-R 260



For cable receptacle (accessories), right angle, Part No. 6006 613. and straight, Part No. 6006 612, see page 150.

- Signal strength indicator at top
- 2 Threaded mounting holes M6, 8 mm deep
- 3 Alignment sight
- 4 Signal strength indicator at front
- 6 Light source
- 6 Light receiver

- PG 13.5 cable gland (for cable diameter 7 to 15 mm)
- 8 Time delay switch, on relay version with light/dark selection
- 9 Sensitivity control
- Time delay control
- 1 Terminal strip
- Status indicator

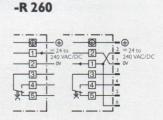
For mounting bracket (accessories), Part No. 2011 480, see page 147. For ball-joint bracket (accessories), Part No. 2011 436, see page 147. For dust shield (accessories), Part No. 2011 432, see page 152. For snow shield (accessories), Part No. 2011 431, see page 152. For cooling plate (accessories), Part No. 2011 435, see page 152. For reflectors (accessories), see page 144.

-P 260

#### **Connection Diagram**

WL 45

-N 260



# **WL 45**

# **Photoelectric Reflex Switch**

WL 45	-N 260 -P 260 -R 260						
Part No.	1008 669	1008 668	1008562				
Type of connection	terminal chamber						
Mounting bracket, Part No.	2011 480	2011 480					
Ball-joint bracket, Part No.	2011 436						
Scanning range							
With OP 60-∞¹) reflector	Part No. 1000141	1 to 45 m					
With four PL 80 reflectors	4 x Part No. 1003 865	0 to 28 m					
With PL 80 reflector	Part No. 1003 865	0 to 20 m					
With C 110 reflector	Part No. 5304549	0.1 to 15 m					
With PL 50 reflector	Part No. 1000132	0 to 11 m					
With PL 30 reflector	Part No. 1002314	0 to 9 m					
With "Diamond Grade" reflective tape	Part No. 4019 634	0.3 to 8 m (min. area: 80	$\times$ 80 mm <sup>2</sup> )				
Supply voltage V <sub>s</sub>	10 to 60 VDC <sup>2</sup> )		24 to 240 VAC/DC <sup>3</sup> )				
Current consumpt./power consumpt. <sup>4</sup> )	≤50 mA/≤250 mA		≦3 VA/≦6 VA				
Ripple max. <sup>5</sup> )	5 V <sub>pp</sub>						
Light source	LED, visible red light, modulated, average service life 100,000 h <sup>6</sup> )						
Light spot diameter	approx. 230 mm at a dis						
Switching outputs	NPN, $Q$ and $\overline{Q}$	PNP, Q and $\overline{Q}$	SPDT, isolated <sup>7</sup> )				
Signal voltage HIGH/switch. voltage max.	approx. V <sub>s</sub>	V <sub>S</sub> − (≦1.5)	250/120 V (AC/DC)				
Signal voltage LOW/switch. current max.	≦1.5 V	approx. 0 V	4/2 A (AC/DC)				
Output current max./switch. power max.	200 mA		750 VA/120 W (AC/DC				
Response time <sup>8</sup> ); switching frequency <sup>9</sup> )	≤1.2 ms; max. 400/s		≤20 ms; max. 10/s				
Time delay	switch-selectable						
Switch position t <sub>0</sub>	no time delay						
Switch position t <sub>1</sub> (or t <sub>3</sub> )	delay from leading edge	of object					
Switch position $t_2$ (or $t_4$ )	delay from trailing edge						
Time delays	0.015 to 0.3 s or 0.5 to 1		0.5 to 12 s				
Adjustable with	270°-potentiometer						
Alarm output	dirt build-up signalling						
Output/output current max.	open collector/100 mA						
"Sufficient" light received (sign.res.≥50%)	output LOW	output HIGH (+V <sub>S</sub> -1.5V)					
"Insufficient" light received	switching periodically at						
Test input	light source deactivated						
Internal resistance	≥33 kΩ						
Enclosure rating	IP 67; with plug IP 65						
Circuit protection <sup>10</sup> )	A, B, C						
Ambient operating temperature		ng, to +120°C with cooling					
Storage temperature	-40 to +70°C						
Weight	approx. 800 g						
1) Position-dependent: action of reflector may have	5) Must be within V <sub>s</sub> tolerances	9) With light/da	ark time ratio of 1:1; no time delay				

Position-dependent: action of to be optimized by turning it
 Limit values
 +10%, -25%
 Without/with lens heater

Available on I	Request:				- X
with Iens heater with 7-pin plug, to DIN 43 651		to DIN 43 651	with lens heater and 7-pin plug to DIN 43 651		
WL 45-N 250	Part No. 1008839	WL 45-N 660	Part No. 1008830	WL 45-N 650	Part No. 1008838
WL 45-P 250	Part No. 1008840	WL 45-P 660	Part No. 1008831	WL 45-P 650	Part No. 1008837
WL 45-R 250	Part No. 1008841	WL 45-R 660	Part No. 1008832	WL 45-R 650	Part No. 1008836

 <sup>5)</sup> Must be within V<sub>s</sub> tolerances
 6) At room temperature = +25°C
 7) Provide suitable arc suppression with inductive or capacitive loads
 8) With resistive load; no time delay

With light/dark time ratio of 1.1; no time delay
 A = supply connections reverse-polarity protected
 B = outputs Q and Q short circuit protected
 C = interference suppression



#### Adjustable Scanning Distance

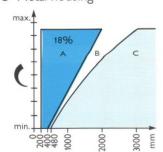


400 to 2000



#### **Features**

- Continuously adjustable scanning distance
- Background suppression
- Status indicator in terminal chamber
- Supply connections reversepolarity protected
- Light- and dark-switching
- Transistor outputs short circuit protected
- Insensitive to ambient light
- Switch-selectable time delay
- Test input (not on WT 45-R)
- No false triggering on power-up
- Wide supply voltage ranges for direct and universal voltage
- Glass sealing disk, 5 mm thick
- Metal housing

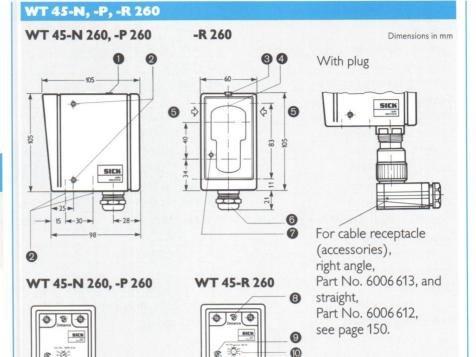


Background suppression

A = scanning range

B = background suppression range

C = background



- Signal strength indicator at top
- 2 Threaded mounting holes M6, 8 mm deep
- Alignment sight

a :Ö

- 4 Center of optical axis
- 6 Relative direction of movement of object being scanned
- 6 PG 13.5 cable gland (for cable diameter 7 to 15 mm)

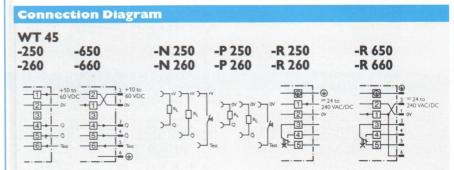
- 7 Signal strength indicator at front
- 8 Scanning distance control
- 9 Time delay control 0.5 to 12 s
- Time delay switch, on relay version with light/dark selection
- 1 Terminal strip

0

12

2 Status indicator

For mounting bracket (accessories), Part No. 2011 480, see page 147. For ball-joint bracket (accessories), Part No. 2011 436, see page 147. For dust shield (accessories), Part No. 2011 432, see page 152. For snow shield (accessories), Part No. 2011 431, see page 152. For cooling plate (accessories), Part No. 2011 435, see page 152.



# WT 45 Photoelectric Proximity Switch

WT 45	-N 260	-P 260	-R 260				
Part No.	1009109	1009108	1009107				
Type of connection	terminal chamber						
Mounting bracket, Part No.	2011 480						
Ball-joint bracket, Part No.	2011 436						
Scanning distance, adjustable	400 to 2000 mm	400 to 2000 mm					
Scanning range <sup>1</sup> ) w/ background suppr.	200 to 400 mm / 200 to 2000 mm						
Supply voltage V <sub>S</sub>	10 to 60 VDC <sup>2</sup> )		24 to 240 VAC/DC <sup>3</sup> )				
Current consumpt./power consumption <sup>4</sup> )	≦50 mA/≦250 mA		≦3 VA/≦6 VA				
Ripple <sup>5</sup> )	≦5 V <sub>pp</sub>		_				
Light source		ated, average service life 10	00,000 h <sup>6</sup> )				
Light spot diameter		approx. 35 mm at a distance of 2000 mm					
Switching outputs	NPN, Q and $\overline{Q}$	PNP, Q and $\overline{\mathbb{Q}}$	SPDT, isolated <sup>7</sup> )				
Signal voltage HIGH/switch. voltage max.	approx. V <sub>S</sub>	V <sub>s</sub> − (≦2 V)	250/120 V (AC/DC)				
Signal voltage LOW/switch. current max.	≦2 V	approx. 0 V	4/2 A (AC/DC)				
Output current max./switch. power max.	200 mA	750/120 VA (AC/DC)					
Response time <sup>8</sup> ); switching frequency <sup>9</sup> )	max. 6 ms; max. 50/s		≤20 ms; max. 10/s				
Time delay <sup>10</sup> )	switch-selectable						
Switch position t <sub>0</sub>	no time delay						
Switch position t <sub>1</sub> or t <sub>3</sub>	delay from trailing ed	ge of object					
Switch position t <sub>2</sub> or t <sub>4</sub>	delay from leading ed	ge of object					
Time delays	0.015 to 0.3 s or 0.5 t	o 12 s	0.5 to 12 s				
Adjustable with	270°-potentiometer						
Test input	light source deactivate	ed					
Internal resistance	≧33 kΩ						
Enclosure rating	IP 67; with plug IP 65						
Circuit protection <sup>11</sup> )	A, B, C						
Ambient operating temperature max.	-25 to +55°C no co	ooling, +120°C with cooling	g				
Storage temperature	-40 to +70°C						
Weight	approx. 750 g						
1) Material with 18% reflectance (based on white standard, to DIN 5033) 2) Limit values 3) +10%, -25% 4) Without/with lens heater 5) Must be within V <sub>s</sub> tolerances	At room temperature = +2.     Provide suitable arc suppres inductive or capacitive loads.     With resistive load; no time 9) With light/dark time ratio of 10) Adjustable in terminal chaml	sion with  delay 11:1: no time delay	) A = supply connections reverse-polarity protected B = outputs Q and \( \overline{Q} \) short circuit protecte C = interference suppression				

Available on Request:		
with lens heater	with 7-pin plug, to DIN 43 651	with lens heater and 7-pin plug, to DIN 43 651
WT 45-N 250 Part No. 1009116	WT 45-N 660 Part No. 1009110	WT 45-N 650 Part No. 1009115
WT 45-P 250 Part No. 1009117	WT 45-P 660 Part No. 1009111	WT 45-P 650 Part No. 1009 114
WT 45-R 250 Part No. 1009118	WT 45-R 660 Part No. 1009112	WT 45-R 650 Part No. 1009113

# W 32-Series Photoelectric Proximity Switches



Photoelectric proximity switches in glassfiber-reinforced plastic housing. With sensitivity control and signal strength indicator.

With terminal chamber (cable gland PG 11) conforming to IP 67; also available with plug, to IP 65. Supply voltage range 10 to 30 V direct voltage or 24 to 240 V universal voltage.

Output for external dirt build up monitoring and test input to test sensor on demand from remote location (direct-voltage version).

Outputs possible with NPN, PNP and B configurations.



Behind back cover: selector switch for time delay; light/dark selector; time-delay and sensitivity controls.



Terminal chamber on models with and without plug.

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#### **Scanning Range**

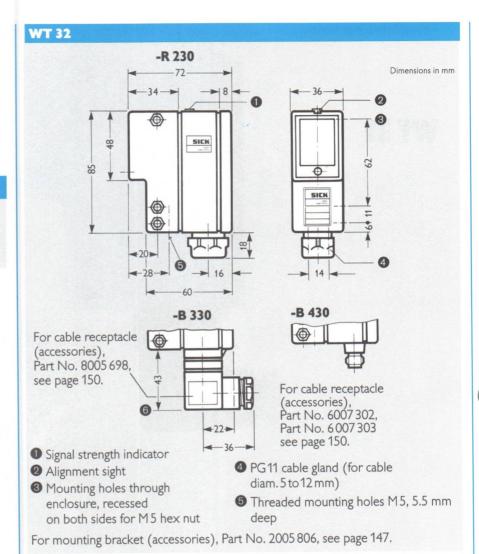


100 to 2000 mm

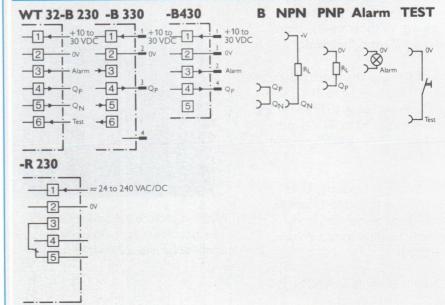


#### **Features**

- Blinking LED signal strength indicator to show dirt build-up on optics
- Supply connections reversepolarity protected
- Choice of light- or dark-switching
- Adjustable scanning distance
- Transistor outputs short circuit protected, PNP or NPN
- Insensitive to ambient light
- Switch-selectable time delay
- Test input to test sensor on demand from remote location (not on WT 32-R)
- No false triggering on power-up
- Direct-voltage and alternating voltage supply (WT 32-R)



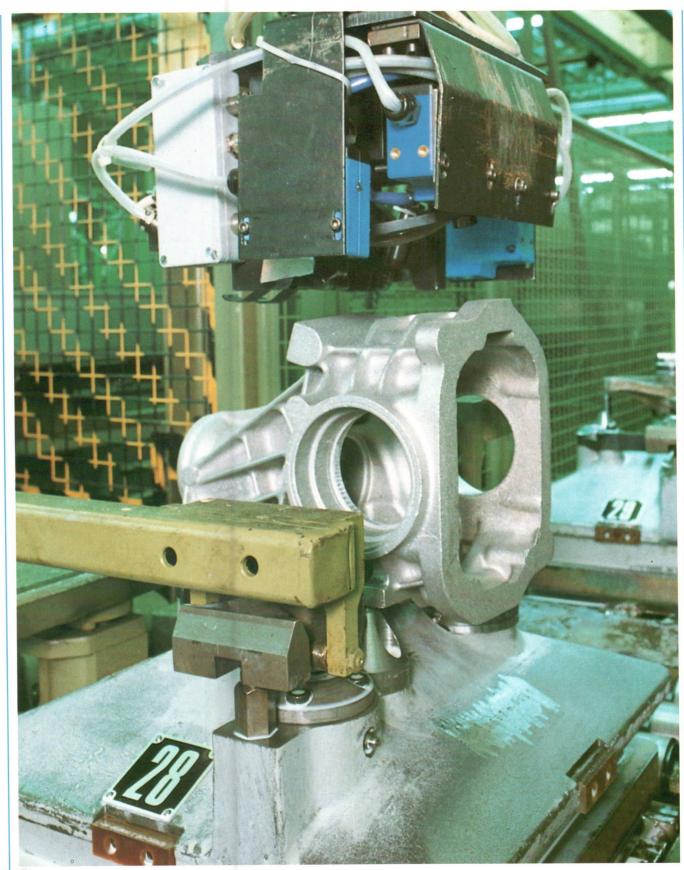




# **Photoelectric Proximity Switch**

WT 32	-В 230	-B 430	-B 330	-R 230	
Part No.	1007397	1011110	1007411	1007413	
Type of connection $(T/P)^1$ )	Т	P, 4-pin	P, 3-pin	Т	
Cable receptacle, Part No.		6006 612 6006 613	6005 698		
Mounting bracket, Part No.	2005 806				
Scanning range <sup>2</sup> )	100 to 2000 r	nm			
Supply voltage V <sub>S</sub>	10 to 30 VDC	23)	24 to 240 VAC/DC (+10%, -25%		
Current consumption/power consumption	≦40 mA		<2 VA		
Ripple max. <sup>4</sup> )	5 V <sub>pp</sub>				
Light source	LED, infrared	, modulated, ave	erage service life	100,000 h <sup>5</sup> )	
Light spot diameter	approx. 60 m	m at a distance of	of 2 m		
Light receiver switching mode	light- or dark-	switching, switch	n-selectable		
Max. scanning distance	adjustable (in	the terminal cha	ımber)		
Signal strength indicator	LED				
Switching outputs	PNP/NPN		PNP	SPDT, electrically isolated <sup>6</sup> )	
Signal voltage HIGH/switching volt. max.	$V_{\rm S} - (\leq 1.5)^7$	<b>)</b>	250 VAC		
Signal volt. LOW/switching current max.	≤1.5 V <sup>8</sup> )			3 A	
Output current max./switch. power max.	200 mA		500 VA		
Response time <sup>9</sup> ); switching frequency <sup>10</sup> )	$\leq$ 5.6 ms; max. 80/s <sup>11</sup> )			<20 ms; max. 10/s	
Time delay <sup>5</sup> )	switch-selecta	ble (in the term			
Switch position 0/t		time delay activ			
Switch position 1/2	delay from lea	ding edge of ob	trailing edge of object		
Time delay	0.02 to 1 s			0.5 to 12 s	
Adjustable with	270°-potentic	meter			
Alarm output	dirt build-up s	ignalling	_		
PNP output	open collector		_		
"Sufficient" light received <sup>12</sup> )	output HIGH	$(+V_{s}-1.5 V)$	_		
"Insufficient" light received	switch. period				
Test input	sender deact.		_		
Internal resistance	≥15 kΩ		-		
Sender "active"	+V <sub>s</sub> or not co	n. –	1-		
Sender "inactive"	0 V		-		
Enclosure rating	IP 67		IP 65	IP 67	
Circuit protection <sup>13</sup> )	A, B, C				
Ambient operating temperature	-25  to  +55  °C	C			
Storage temperature	-40  to  +70  °C	C			
Weight	165 g				
1) T = terminal chamber; P = plug connector					

<sup>1)</sup> T = terminal chamber; P = plug connector
2) Based on white standard, to DIN 5033
3) Limit values
4) Must be within V<sub>5</sub> tolerances
5) At room temperature = +25 °C
6) Provide suitable arr suppression with inductive or capacitive loads
7) NPN output: +V<sub>5</sub>
8) PNP output: +0.1 V
9) With resistive load
10) With light/dark time ratio of 1:1
11) No time delay
12) Signal reserve ≥50%
13) A = supply connections reverse-polarity protected B = outputs Qp and QN short circuit protected C = interference suppression



96 WT 30 photoelectric proximity switches control robot for precise positioning of gaerbox cases

## W 30-Series Photoelectric Switches



Photoelectric proximity switches in glassfiber-reinforced plastic housing. With status indicator. Detects materials with extremely low reflectance.

Terminal chamber. Enclosure rating IP 67. Supply voltage range 10 to 30 V.

Built-in background suppression beginning at end of specified scanning range.

Outputs in <u>NPN and PNP</u> configuration, with and without current limitation; <u>B configuration</u> also possible.



Terminal chamber with enclosurerating IP 67 (dusttight, watertight).



Status indicator and alignment sight.

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#### **Scanning Distance**

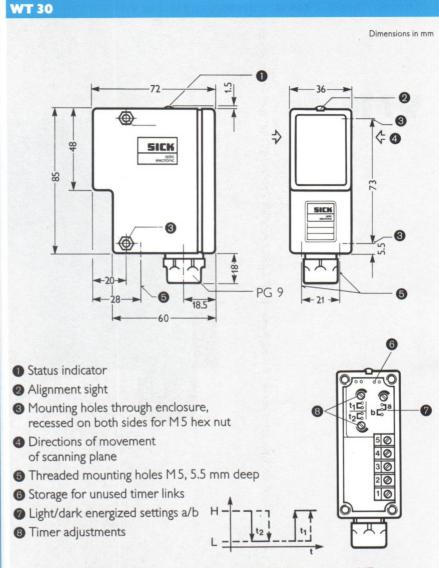


300 mm

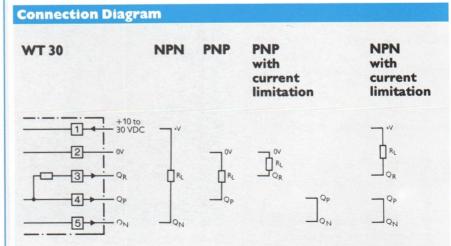


#### **Features**

- Detects materials with extremely low reflectance
- Background suppression
- Supply connections reversepolarity protected
- Light- or dark-switching
- Status indicator
- Complementary switching outputs
- Separate output with current limitation
- Switch-selectable time delays t<sub>1</sub> and t<sub>2</sub>
- Separately adjustable time delays
- Glassfiber-reinforced plastic housing



For mounting bracket (accessories), Part No. 2005 806, see page 147.

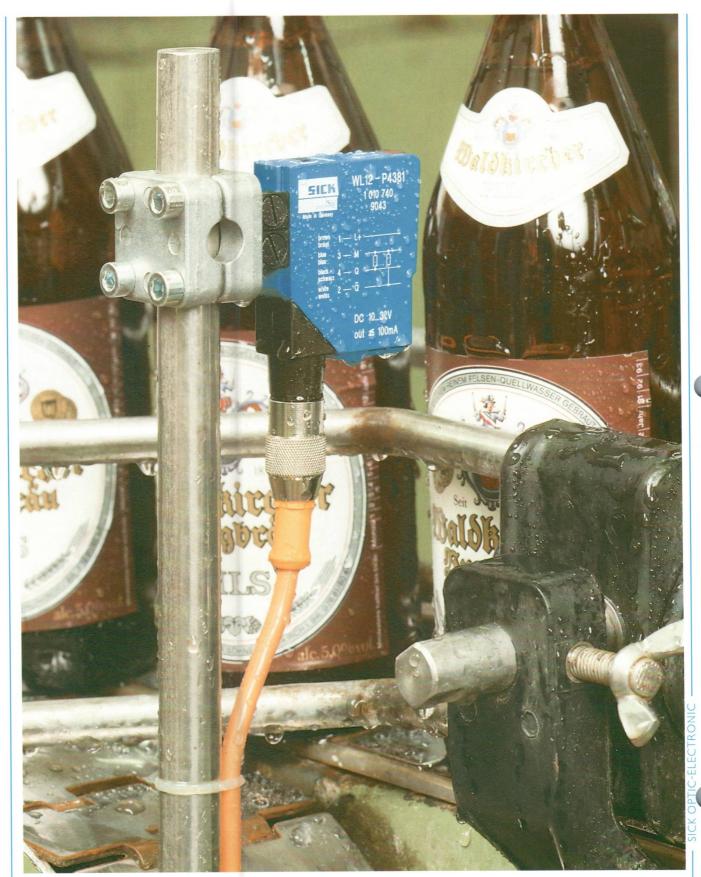


# **WT 30**

# **Photoelectric Proximity Switch**

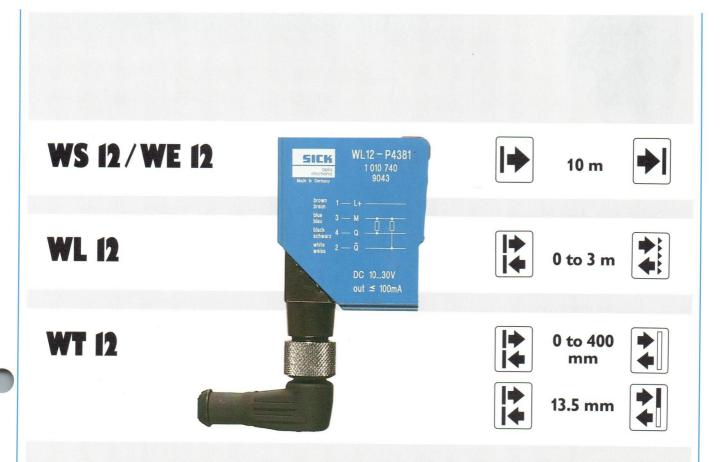
WT 30	-01	-11	-21	-02	-12	-22		
Part No.	1004179	1004489	1004585	1004180	1004490	1004586		
Type of connection	terminal chan	terminal chamber						
Mounting bracket, Part No.	2005 806							
Scanning range	30 to 305 mm	15to100mm	25 to 200 mm	30 to 305 mm	15to100mm	25to200mr		
Tolerance on max. scanning range	±10 mm	±4 mm	±6 mm	±10 mm	±4 mm	±6 mm		
Black/white scanning-distance difference	±5 mm	±2 mm	±3 mm	±5 mm	±2 mm	±3 mm		
Supply voltage V <sub>S</sub>	10 to 30 VDC	10 to 30 VDC <sup>1</sup> )						
Current consumption (no load)	≦80 mA							
Ripple <sup>2</sup> )	≤10 V <sub>DD</sub>	≦10 V <sub>op</sub>						
Light source		, modulated,	average service	life 100,000 h	3)			
Light spot diameter	11 mm	3.5 mm	11 mm	11 mm	3.5 mm	11 mm		
At a distance of	300 mm	100 mm	200 mm	300 mm	100 mm	200 mm		
Light receiver switching mode <sup>4</sup> )	light- or dark-	light- or dark-switching						
Signal strength indicator	LED							
Switching outputs <sup>5</sup> )	NPN, PNP, B							
Signal voltage HIGH <sup>6</sup> )	V <sub>S</sub> −(≦1.5)							
Signal voltage LOW <sup>7</sup> )	<1.0 V							
Output current max.	250 mA							
Response time <sup>8</sup> ); switching frequency <sup>9</sup> )	<15 ms; max	. 30/s		<15 ms; max.	30/s <sup>10</sup> )			
Time delay <sup>4</sup> )					, ,			
Jumper t <sub>1</sub> inserted				delayed LOW	/-HIGH transit	tion		
Jumper t <sub>2</sub> inserted	_			delayed HIGH				
Time delays				0.04 to 12 s	- Gransk	CIOII		
Adjustable with				20 turn helipo	†			
Enclosure rating	IP 67			20 carri riciipo				
Ambient operating temperature	$-25 \text{ to } +55^{\circ}$	С						
Storage temperature	$-40 \text{ to } +80^{\circ}$	С						
Weight	approx. 210 g							
1) Limit values	., .							

<sup>1)</sup> Limit values
2) Must be within V<sub>s</sub> tolerances
3) At room temperature = +25 °C
4) Pluggable or adjustable in terminal chamber
5) Can be selected using terminal connections
6) NPN output: +V<sub>s</sub>
7) PNP output: approx. 0 V
8) With resistive load
9) With light/dark time ratio of 1:1
10) No time delay



100 WL 12 photoelectric reflex switches counting bottles on a filling machine

## **W 12 Series Photoelectric Switches**



Photoelectric switches in solid metal housing, including WT 12 photoelectric proximity switches with infinitely adjustable scanning distances and optional background or foreground suppression and WL 12 photoelectric switches with polarizing filters.

WS/WE 12 through-beam photoelectric switches, with test input for monitoring its operation.

Signal strength indicator (blinking) to show misalignment or dirt buildup on the optics, providing forewarning of failure.

Available with plug or permanently connected cable.

Supply voltage 10 to 30 V.

Insensitive to ambient light due to pulse modulation.

Complementary switching outputs for light or dark-switching, with short circuit protection, in NPN or PNP versions.



Signal strength indicator clearly visible from front and above.

Available as through-beam photoelectric switch, photoelectric reflex and proximity switch, and as contrast sensor.



Behind the precision optics of the WL 12: polarizing filters, allowing recognition of objects with reflective surfaces too.



#### **Scanning range**

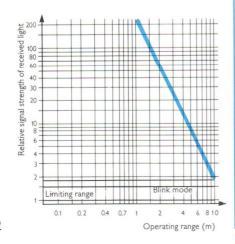


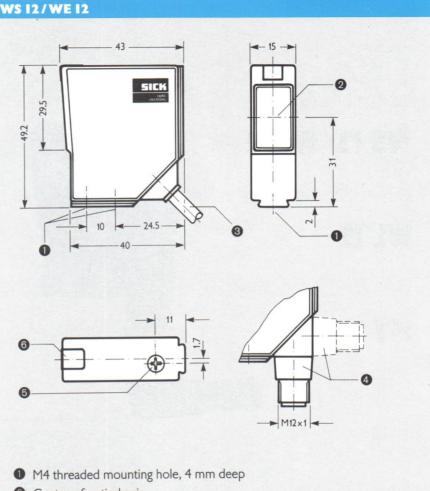
0 to 10 m



#### **Features**

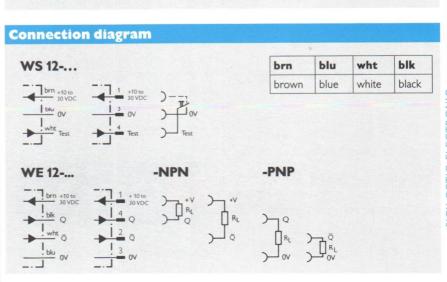
- Blinking signal strength indicator to show misalignment and provide forewarning of failure
- Supply connections reversepolarity protected
- Power indicator for light sender, signal strength indicator for light receiver
- Complementary switching outputs Q and  $\overline{Q}$
- Switching outputs short circuit protected
- Insensitive to ambient light
- Test input for testing device and system
- No false triggering on power-up
- Solid metal housing, zinc diecasting or stainless steel
- Adjustable sensitivity





- 2 Centre of optical axis
- 3 Connecting cable, 2 m long
- 4-pin plug
- Sensitivity control
- 6 Signal strength indicator, power indicator

Mounting brackets and cable receptacles: see Accessories (page 147, 150)



# WS 12/WE 12 through-beam photoelectric switch

Model WS 12/WE 12	2 -N	-P
Scanning range	10 m	
Supply voltage V <sub>s</sub>	10 to 30 VDC (limit valu	es)
Current consumption (no load)	≤ 40 mA	
Ripple <sup>1)</sup>	5 V <sub>pp</sub>	
Light sender	IR LED, modulated, avera	age life 100 000 h <sup>2)</sup>
Angle of dispersion	approx. 1.5°	
Light-spot diameter	130 mm at distance of 5	m
Transistor outputs Q and Q	NPN	PNP
Signal voltage HIGH	approx. V <sub>S</sub>	V <sub>S</sub> - (≦ 1.8 V) <sup>3)</sup>
Signal voltage LOW <sup>3)</sup>	≦1.8 V	0 V
Output current I <sub>A</sub> max.	100 mA	
Response time <sup>4)</sup> ; Switching freq., max. <sup>5)</sup>	≤ 500 μs; 1000/s	
Test input	Light source disabled	
Internal resistance	≥ 22 kΩ	
Enclosure rating	IP 67	
Protection circuits <sup>6)</sup>	А, В, С	
Ambient operating temp. <sup>7)</sup>	-40 to +55 °C	
Storage temperature <sup>7)</sup>	-40 to +75 °C	
Weight (sender + receiver)	with plug 260 g; with con	necting cable 400 g
1) Must remain within V <sub>S</sub> tolerances 2) At room temperature = +25 °C	6) A = V <sub>S</sub> connections reverse-polarit B = Outputs O and O short circuit	y protected

a) At room temperature = +25 °C and 100 mA output current 4) With resistive load 5) With light/dark ratio of 1:1

B = Outputs Q and Q short circuit protected
C = Interference suppression
7) Do not deform connecting cables at temperatures below 0 °C;
do not operate adjusting knob at temperatures below -25 °C

Housing	Connector (2 m)	Connector cable (2 m)		Plug (4-pin, below)		Plug (4-pin, rear)	
	Model	Part no.	Model	Part no.	Model	Part no.	
Standard housing	N 1321 P 1321	1010819 1010820	N 4381 P 4381	1010821 <b>1010822</b>	P 4371	1011 028	
Stainless steel	N 1322 P 1322	1011 029 1011 030	N 4382 P 4382	1011 031 1011 032	P 4372	1011 034	



#### **Scanning range**

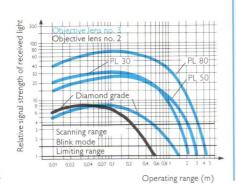


0 to 3 m

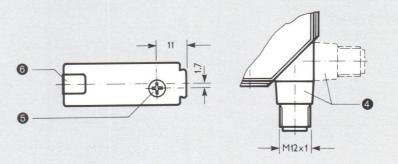


#### **Features**

- Polarizing filters, permitting detection of objects with reflective surfaces too
- Blinking signal strength indicator to show misalignment and provide forewarning of failure
- Supply connections reversepolarity protected
- Complementary switching outputs
   O and \overline{\Omega}
- Sensitivity control
- Switching outputs short circuit protected
- Insensitive to ambient light
- No false triggering on power-up
- Solid metal housing, zinc diecasting or stainless steel

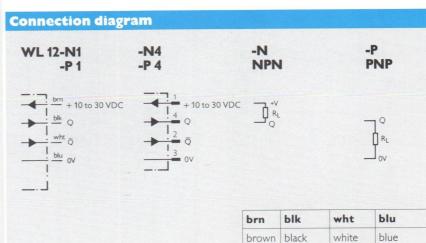


WL 12



- 1 M4 threaded mounting hole, 4 mm deep
- 2 Centre of optical axis
- 3 Connecting cable, 2 m long
- 4 4-pin plug
- Sensitivity control
- 6 Signal strength indicator, power indicator

Mounting brackets, reflectors and cable receptacles: see Accessories (page 147, 150)



# **WL 12** photoelectric reflex switch

WL 12	Objective	lens no. 3	Objective lens no. 2		
	Ν	P	N	Р	
Scanning range <sup>1)</sup>					
with PL 80 reflector	0 to 3 m				
with PL 50 reflector	Ó to 2 m				
with PL 30 reflector	0 to 1.5 m				
with "Diamond Grade" reflective tape	0 to 0.5 m		0 to 200 mm		
Supply voltage V <sub>s</sub>	10 - 30 VDC	(limit values)			
Current consumption (no load)	≦40 mA				
Ripple <sup>2)</sup>	≤5 V <sub>pp</sub>				
Light sender	LED, visible red light, modulated, average life 100 000 h <sup>3)</sup>				
Angle of dispersion	approx. 1.2°				
Lightspot diameter	60 mm at 3 m distance		≤2 mm at 90 mm dist.		
Transistor outputs Q and Q	NPN	PNP	NPN	PNP	
Signal voltage HIGH	Vs	$V_{S} - ( \le 1.8 \text{ V})$	Vs	V <sub>S</sub> − (≦ 1.8 V)	
Signal voltage LOW <sup>4)</sup>	≦1.8 V	0 V	1.8 V	0 V	
Output current I <sub>A</sub> max.	100 mA				
Response time <sup>5)</sup> Switching freq., max. <sup>6)</sup>	$\leq 500  \mu s; 100$	00/s			
Enclosure rating	IP 67				
Protection circuits <sup>7)</sup>	A, B, C				
Ambient operating temp. <sup>8)</sup>	-40 to +55 °C				
Storage temperature <sup>8)</sup>	-40 to +75 °C	C			
Weight	with plug app	rox. 130 g; with connecting	ng cable approx.	200 g	

1) Typical scanning range
2) Must remain within V<sub>S</sub> tolerances
3) At room temperature = +25 °C
4) At room temperature = +25 °C and 100 mA output current
5) With resistive load
6) With light/dark ratio of 1:1

7) A = Vs connections reverse-polarity protected
 B = Q and Q outputs short circuit protected
 C = Interference suppression
 8) Do not deform connecting cables at temperatures below 0 °C;
 do not operate adjusting knob at temperatures below -25 °C

Housing	Objective lens	Connecting cable (2m)		Plug (4-pin, below)		Plug (4-pin, rear)	
		Model	Part no.	Model	Part no.	Model	Part no.
Standard housing	No. 3 No. 2	N 1321 P 1321 N 1221 P 1221	1010738 1010593 1010804 1010594	N 4381 P 4381 N 4281 P 4281	1010739 1010740 1010805 1010748	P 4371	1011 036
Stainless steel	No. 3 No. 2	N 1322 P 1322 N 1222 P 1222	1011 041 1011 042 1011 047 1011 048	N 4382 P 4382 N 4282 P 4282	1011 043 1011 044 1011 049 1011 050	P 4372	1011 046



#### **Scanning range**

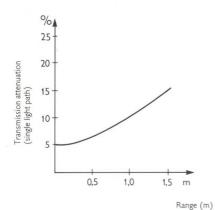


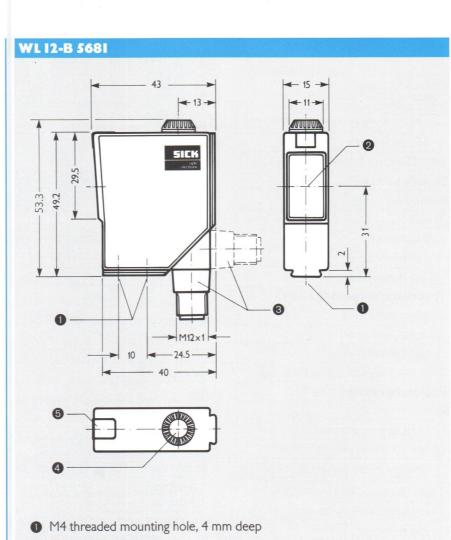
0 to 1.5 m



#### **Features**

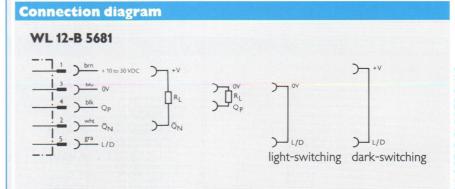
- Detection of glass and transparent films
- LED light sender, visible red light
- Supply connections reversepolarity protected
- No false triggering on power-up
- NPN and PNP switching output
- Insensitive to ambient light
- Polarizing filter, allowing detection of objects with reflective surfaces too
- Light or dark-switching, selection via control line
- Status indicator
- Switching frequency up to 1.3 kHz
- Solid metal housing, zinc diecasting or stainless steel
- Adjustable sensitivity





- 2 Centre of optical axis
- 3 5-pin plug
- 4 Sensitivity control
- Signal strength indicator

Mounting brackets and reflectors: see Accessories (page 147, 144, 150)



gray brown blu blk wht gray brown blue black white

# WL 12-B 5681 photoelectric reflex switch with low switching hysteresis

WL 12-B 5681						
Scanning range						
with PL 80 reflector	0 to 1.5 m					
with PL 50 reflector	0 to 1.0 m					
with PL 30 reflector	0 to 1.0 m	0 to 1.0 m				
Supply voltage V <sub>S</sub>	10 to 30 VDC (	10 to 30 VDC (limit values)				
Current consumpt. (no load) at 24 VDC	≦25 mA					
Ripple <sup>1)</sup>	≤5 V <sub>pp</sub>					
Light sender	LED, visible red	light, modulated, average li	fe 100 000 h <sup>2)</sup>			
Angle of dispersion	approx. 1.2°					
Lightspot diameter	approx. 30 mm	at distance of 1.5 m				
Transistor outputs Q <sub>P</sub> and Q <sub>N</sub>		PNP	NPN			
Output voltage HIGH		V <sub>S</sub> -≦2V	V <sub>S</sub>			
Output voltage LOW		0 V	≤2 V			
Output current I <sub>A</sub> max.		100 mA	100 mA			
Operating mode	light- or dark-sw	ritching, L/D reversible via	control line			
Control input L/D	0 V or unswitche	ed: light-switching				
Control input L/D	V <sub>s</sub> : dark-switchin	ng				
Response time, max.; Switching freq., max. <sup>3)</sup>	360 μs; 1300/s					
Enclosure rating	IP 67					
Protection circuits <sup>4)</sup>	A, B, C					
Ambient operating temp.	-25 to +55 °C					
Storage temperature	-25 to +75 °C					
Weight	approx. 130 g.					

Must remain within V<sub>S</sub> tolerances
 At room temperature = +25 °C
 With light/dark ratio of 1:1
 A = V<sub>S</sub> connections reverse-polarity protected B = Q<sub>N</sub> and Qp outputs short circuit protected C = Interference suppression

Selection table					
Housing	Plug, below		Plug, rear		
	Model	Part no.	Model	Part no.	
Standard housing	B 5681	1011 039	B 5671	1011 040	
Stainless steel	B 5682	1011 053	B 5672	1011 054	

part no. 6008899 Accessories: 2 m connection cable with straight cable connector; 2 m connection cable with right angle cable connector; part no. 6008 900



# Adjustable scanning range

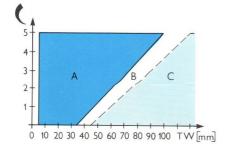


35 to 100 mm



#### **Features**

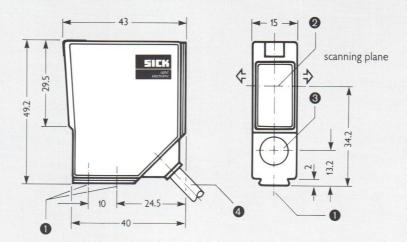
- Light sender: visible red light
- Infinitely adjustable scanning range
- Foreground suppression
- Blinking signal strength indicator to show misalignment and provide forewarning of failure
- Supply connections reversepolarity protected
- Complementary switching outputs Q and Q
- Switching outputs short circuit protected
- Insensitive to ambient light
- No false triggering on power-up
- Metal housing, zinc diecasting or stainless steel

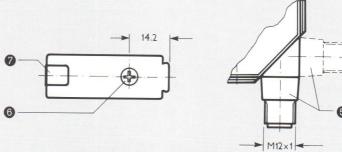


Foreground blanking

- A = Foreground blanking range
- $B = Scanning range R \ge 9 \%$
- C = Scanning range dependent on reflectivity of object to be sensed

# WT 12

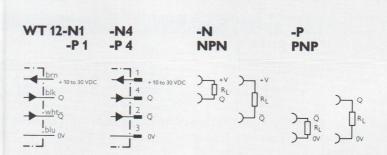




- 1 M4 threaded mounting hole, 4 mm deep
- 2 Centre of receiver optical axis
- 3 Centre of emittor optical axis
- 4 Connecting cable, 2 m long
- 6 4-pin plug
- **6** Scanning range control
- Signal strength indicator

Mounting brackets and cable receptacles: see Accessories (page 147, 150)

# **Connection diagram**



brn	blk	wht	blu	1
brown	black	white	blue	

# WT 12 photoelectric proximity switch with foreground suppression

WT 12	N	P		
Scanning range, adjustable <sup>1)</sup>	35 to 100 mm			
Supply voltage V <sub>s</sub> <sup>2)</sup>	10 to 30 VDC			
Current consumption (no load)	≤ 40 mA			
Ripple <sup>3)</sup>	≤5 V <sub>pp</sub>			
Light sender	LED, visible red light, modulated, average life 100 000 h <sup>4</sup> )			
Light-spot diameter	2 mm at distance of 60 m	nm		
Transistor outputs	NPN	PNP		
Signal voltage HIGH	approx. V <sub>S</sub>	$V_S - ( \le 1.8 \text{ V})^{5)}$		
Signal voltage LOW <sup>5)</sup>	≤1.8 V <sup>5)</sup>	approx. 0 V		
Output current I <sub>A</sub> max.	≦100 mA			
Resp. time, max. <sup>6</sup> ; Switching freq., max. <sup>7</sup> )	500 μs; 1000/s			
Enclosure rating	IP 67 (dusttight, watertigh	nt)		
Protection circuits <sup>8)</sup>	A, B, C			
Ambient operating temp. <sup>9)</sup>	-40 to +55 °C			
Storage temperature <sup>9)</sup>	-40 to +75 °C			
Weight	with plug approx. 130 g;	with connecting cable approx. 200 g		

1) Object with 9 % reflection (based on white standard, to DIN 5033)
2) Limit value
3) Must remain within Vs tolerances
4) At room temperature = +25 °C
5) At room temperature = +25 °C and 100 mA output current

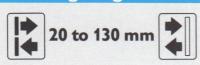
6) With resistive load
7) With light/dark ratio of 1:1
8) A = V<sub>S</sub> connections reverse-polarity protected
B = Q and Q outputs short circuit protected
C = Interference suppression
9) Do not deform connecting cables at temperatures below 0 °C;
do not operate adjusting knob at temperatures below -25 °C

Selection to	able						
	Housing	Connection (2 m)	Connection cable (2 m)		Plug (4-pin, below)		ar)
		Model	Part no.	Model	Part no.	Model	Part no.
with foreground suppression	Standard housing Stainless steel	N 1421 P 1421 N 1422 P 1422	1010 807 1010 596 1011 068 1011 069	N 4481 P 4481 N 4482 P 4482	1010811 1010806 1011070 1011071	P 4471 P 4472	1011 058 1011 073



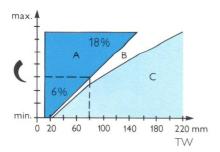


### **Adjustable** scanning range



#### **Features**

- Infinitely adjustable scanning range
- Background suppression
- Blinking signal strength indicator to show misalignment and provide forewarning of failure
- Supply connections reversepolarity protected
- Complementary switching outputs Q and  $\overline{Q}$
- Switching outputs short circuit protected
- Insensitive to ambient light
- No false triggering on power-up
- Metal housing, zinc diecasting or stainless steel

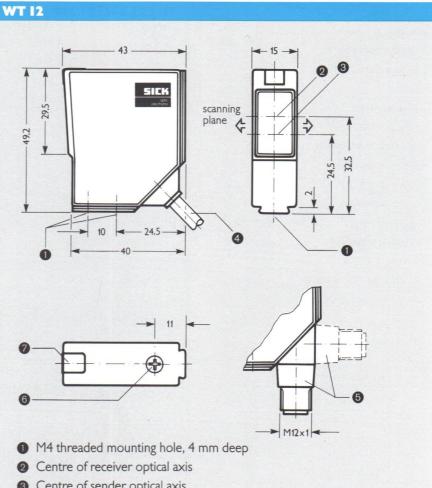


Background suppression

A = scanning range

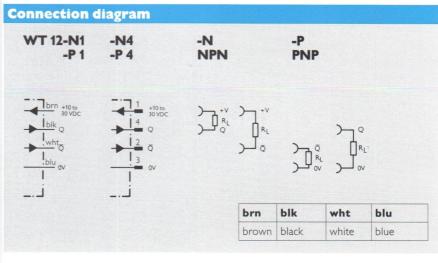
B = background blanking range

C = background



- 3 Centre of sender optical axis
- 4 Connecting cable, 2 m long
- 6 4-pin plug
- 6 Scanning range control
- Signal strength indicator

Mounting brackets and cable receptacles: see Accessories (page 147, 150)



# photoelectric proximity switch with background suppression

WT 12	N	P			
Scanning range, 1) adjustable	20 to 130 mm				
Scanning range	5 to 20 mm and 5 to 130 mm				
Supply voltage V <sub>S</sub>	10 to 30 VDC (limit values)				
Current consumption (no load)	≤ 40 mA				
Ripple <sup>2)</sup>	≤5 V <sub>pp</sub>				
Light sender	LED, infrared modulated, average life 100 000 h <sup>3)</sup>				
Light-spot diameter	4 mm at distance of 80 m	nm			
Transistor outputs	NPN	PNP			
Signal voltage HIGH	approx. V <sub>S</sub>	$V_S - (\le 1.8 \text{ V})^{4)}$			
Signal voltage LOW <sup>4)</sup>	≤1.8 V <sup>4)</sup>	approx. 0 V			
Output current I <sub>A</sub> max.	≦100 mA				
Response time <sup>5)</sup> ; Switching freq., max. <sup>6)</sup>	500 μs; 1000/s				
Enclosure rating	IP 67 (dusttight, watertig	ht)			
Protection circuits <sup>7)</sup>	A, B, C				
Ambient operating temp.8)	-40 to +55 °C				
Storage temperature <sup>8)</sup>	-40 to +75 °C				
Weight	with plug 130 g; with cor	nnecting cable 200 g			

1) Object with 6/18 % reflection (based on white standard, to DIN 5033)
2) Must remain within Vs tolerances
3) At room temperature = +25 °C
4) At room temperature = +25 °C and 100 mA output current
5) With resistive load

6) With light/dark ratio of 1:1
7) A = Vs connections reverse-polarity protected
B = Q and Q outputs short circuit protected
C = Interference suppression
8) Do not deform connecting cables at temperatures below 0 °C;
do not operate adjusting knob at temperatures below -25 °C

	Housing	Connection (2 m)	Connection cable (2 m)		Plug (4-pin, below)		^)
	Model	Part no.	Model	Part no.	Model	Part no.	
with background	Standard housing	N 1121 P 1121	1010808 1010597	N 4181 P 4181	1010809 1010810	P 4171	1011 056
suppression	Stainless steel	N 1122 P 1122	1011 062 1011 063	N 4182 P 4182	1011 064	P 4172	1011 067



# Adjustable scanning range

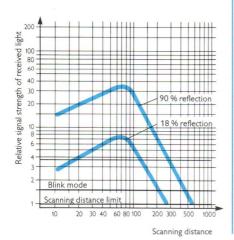


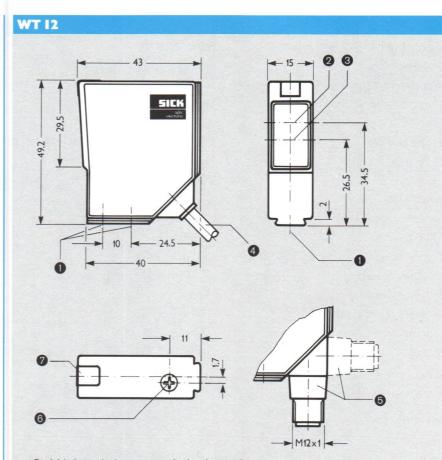
80 to 400 mm



#### **Features**

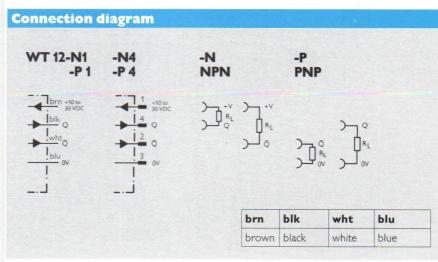
- Adjustable scanning distance
- Blinking signal strength indicator to show misalignment and provide forewarning of failure
- Supply connections reversepolarity protected
- Complementary switching outputs Q and  $\overline{Q}$
- Switching outputs short-circuit protected
- Insensitive to ambient light
- No false triggering on power-up
- Metal housing, zinc diecasting or stainless steel





- 1 M4 threaded mounting hole, 4 mm deep
- 2 Centre of receiver optical axis
- 3 Centre of sender optical axis
- 4 Connecting cable, 2 m long
- 6 4-pin plug
- 6 Sensitivity control
- Signal strength indicator

Mounting brackets and cable receptacles: see Accessories (page 147, 150)



# photoelectric proximity switch energetic

WT 12	N	P
Scanning range, adjustable <sup>1)</sup>	80 to 400 mm	
Supply voltage V <sub>S</sub>	10 to 30 VDC (limit valu	es)
Current consumption (no load)	≤40 mA	
Ripple <sup>2)</sup>	≤5 V <sub>pp</sub>	
Light sender	LED, infrared modulated	, average life 100 000 h <sup>3)</sup>
Light-spot diameter	12 mm at distance of 400	) mm
Transistor outputs	NPN	PNP
Signal voltage HIGH	approx. V <sub>s</sub>	$V_{S} - (\leq 1.8 \text{ V})^{4)}$
Signal voltage LOW <sup>4)</sup>	≤ 1.8 V <sup>4)</sup>	approx. 0 V
Output current I <sub>A</sub> max.	≦100 mA	
Response time <sup>5)</sup> ; Switching freq., max. <sup>6)</sup>	500 μs; 1000/s	
Enclosure rating	IP 67	
Protection circuits <sup>7)</sup>	A, B, C	
Ambient operating temp. <sup>8)</sup>	-40 to +55 °C	
Storage temperature <sup>8)</sup>	-40 to +75 °C	
Weight	approx. 130 g	

1) Object with 90 % reflection (based on white standard, to DIN 5033)
2) Must remain within Vs tolerances
3) At room temperature = +25 °C
4) At room temperature = +25 °C and 100 mA output current
5) With resistive load

6) With light/dark ratio of 1:1
7) A = Vs connections reverse-polarity protected B = Q and Q outputs short circuit protected C = Interference suppression
8) Do not deform connecting cables at temperatures below 0 °C; do not operate adjusting knob at temperatures below -25 °C

Selection t	able						
	Housing	Connection (2 m)	Connection cable (2 m)		Plug (4-pin, below)		hind)
		Model	Part no.	Model	Part no.	Model	Part no.
energetic	Standard housing	N 1521 P 1521	1010741 1010742	N 4581 P 4581	1010745 1010743	P 4571	1011 060
	Stainless steel	N 1522 P 1522	1011 074 1011 075	N 4582 P 4582	1011 076 1011 077	P 4572	1011 079





# **Scanning range**

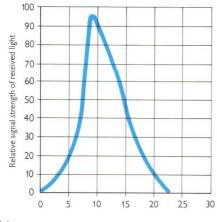


13.5 mm

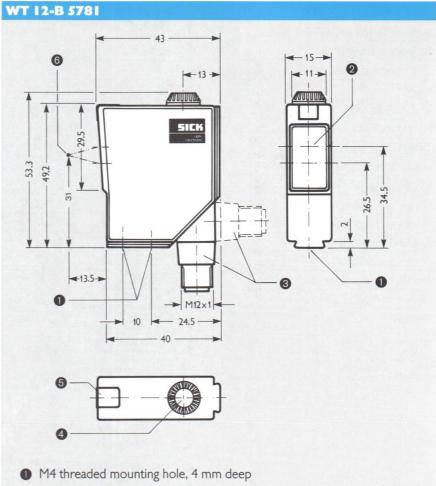


#### **Features**

- LED light sender (green)
- Supply connections reversepolarity protected
- Insensitive to ambient light
- Light- or dark-switching, selection via control line
- Status indicator
- Switching frequency up to 1.3 kHz
- Solid metal housing, zinc diecasting or stainless steel
- Adjustable sensitivity
- NPN and PNP switching outputs



scanning distance



- 2 Centre of receiver optical axis
- 3 5-pin plug
- Sensitivity control
- 6 Signal strength indicator
- 6 Scanning plane

Mounting brackets and cable receptacles: see Accessories (page 147, 150)

# WT 12-B 5781 The state of the

# WT 12-B 5781 contrast sensor with low switching hysteresis

WT 12-B 5781					
Scanning distance	13.5 mm				
Scanning-distance tolerance	± 1.5 mm				
Light-spot diameter	2 mm	2 mm			
Supply voltage V <sub>s</sub>	10 to 30 VDC (limit values)				
Current consumpt. (no load) at 24 VDC	≦25 mA				
Ripple <sup>1)</sup>	$\leq$ 5 $V_{pp}$				
Light sender	LED, modulated, average	life 100 000 h <sup>2)</sup>			
Light wavelength	565 nm (green)				
Switching outputs Q <sub>P</sub> and Q <sub>N</sub>	light- or dark-switching, r	eversible L/D via control line			
Operating mode	PNP	NPN			
Signal voltage HIGH	$V_S = 2V$	V <sub>S</sub>			
Signal voltage LOW	0 V	≤2 V			
Output current I <sub>A</sub> max.	100 mA	100 mA			
L/D control input	0 V or unswitched: light-s	witching			
L/D control input	V <sub>s</sub> : dark-switching				
Resp. time, max., Switching freq., max. <sup>3)</sup>	360 μs; 1300/s				
Enclosure rating	IP 67				
Protection circuits <sup>4)</sup>	A, B, C				
Ambient operating temp.	-25 to +55 °C				
Storage temperature	-25 to +75 °C				
Weight	approx. 130 g				

Must remain within Vs tolerances At room temperature = +25 °C With scanning ratio 1:1 A = Vs connections reverse-polarity protected B = Qp and QN outputs short-circuit protected C = Interference suppression

Selection table					
Housing	Plug, below		Plug, rear		
	Model	Part no.	Model	Part no.	
Standard housing	B 5771	1011 061	B 5781	1010823	
Stainless steel	B 5772	1011 081	B 5782	1011 080	

Accessories: 2 m connecting cable with straight cable connector: 2 m connecting cable with right angle cable connector: part no. 6008 900

116 LP 10 photoelectric reflex switches controlling the final format of printed matters

# P 10 Series Photoelectric Switches

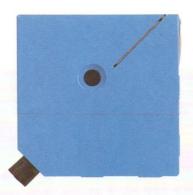
SP 10/EP 10



2000 mm



LP 10



650 mm



Miniature photoelectric switch in a die-cast housing. For high ambient temperatures up to +100°C.

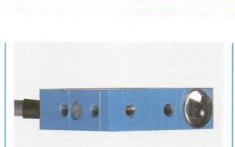
High switching accuracy by virtue of focussed (small) light spot. Spot clearly visible.

NPN or PNP transistor outputs. High switching frequency (10,000 per second).

Non-detachable cable.

Supply voltage range 10 to 30 V; incandescent lamp voltage 3 or 1.5 VAC/DC. Enclosure rating IP 64 (dusttight, waterproof).

Available as through-beam photoelectric switch and photoelectric reflex switch.



Simple to mount using tapped holes at front and underneath.



Non-detachable cable and easily replaceable incandescent-lamp module.

SICK OPTIC-ELECTRONIC



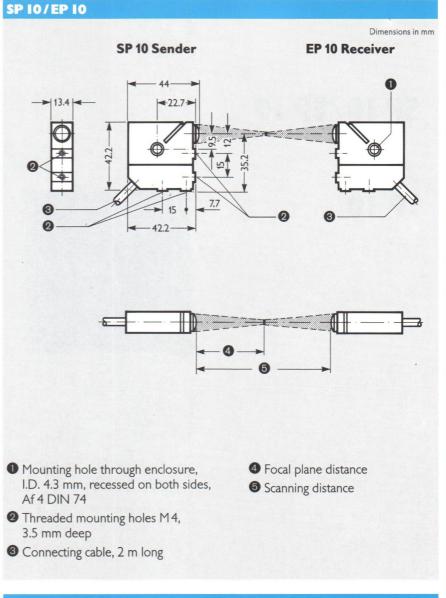


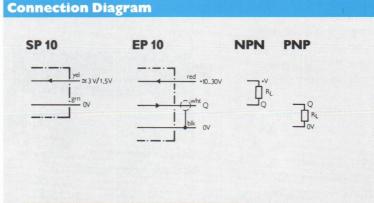
2000 mm



#### **Features**

- Supply connections reversepolarity protected
- NPN or PNP transistor outputs
- Built-in switching amplifier
- Light- or dark-switching
- Die-cast metal housing
- For ambient temperatures up to +100 °C





yel

yellow

VAC/DC 0 V

grn

green

red

red

+ V

wht

white

Q

blk

black

OV

# SP 10/EP 10 **Through-beam Photoelectric Switch**

SP IO/EP IO	0 SP 10 Sender		EP 10 Receiver					
Model	-0211	-0411	-5401	-6401	-3201	-3401	-4201	-4401
Part No.	1006330	1006332	1005 375	1005 379	1005 365	1005 367	1005 369	1005 37
Type of connection	cable							
Focal plane distance <sup>1)</sup>								
With objective lens No. 2	33 mm							
With objective lens No. 4		650 mm						
Scanning distance								
With objective lens No. 2	-				115 mm	- 22.5	115 mm	-
With objective lens No. 4			2000 mm		-11	2000 mm	- 100 4 5 6	2000 mn
Supply voltage V <sub>S</sub>	3 VAC/DC	VAC/DC 10 to 30 VDC <sup>2</sup> )						
Power consumpt./current consumpt. (no load) 3)		≦18 mA ≤12 mA						
Ripple <sup>4)</sup>			≦3 V <sub>pp</sub>					
Light source <sup>5)</sup>	incandescen	t lamp						
Type of light	visible light		E					
Average source life	80,000 h		-					
Light spot size at focal plane distance	$2 \times 1 \text{ mm}^2$	22×11 mm <sup>2</sup>	-					
Light receiver switching mode <sup>6)</sup>			L	D	L		D	
Switching output	-		PNP		NPN			
Signal voltage HIGH/switching voltage max.	-		V <sub>S</sub> − (≦1.	0 V)	V <sub>S</sub> − (≦0.7 V)			
Signal voltage LOW <sup>7)</sup>			≦0.7 V	≤0.7 V ≤1.0 V				
Output current max.	-		200 mA					
Response time <sup>8)</sup> ; switching frequency <sup>9)</sup>	-		≤50 μs;≤	10,000/s				
Enclosure rating	IP 67							
Circuit protection	-		reverse-polarity protected					
Ambient operating temperature <sup>10) 11)</sup>	-20  to  +10	0°C						
Storage temperature <sup>10)</sup>	-25  to  +10	0°C	37.3					
Connecting cable	2 m, 2 x 0.2	5 mm <sup>2</sup> , flex	2 m, 3 x 0	.25 mm², fle	ex, PVC, scr	reened signa	al core	
Weight	130 g							

- 1) Always select light sender and light receiver with same objective lens No.
  2) Limit values
  3) 0.7 VA at 3 V; 0.45 VA at 1.5 V
  4) Must be within V<sub>s</sub> tolerances
  5) Either 3 V lamp (Part No. 1002 802) or 1.5 V lamp (Part No. 1004 444) may be used
  6) L = light-switching, D = dark-switching
  7) At room temperature = +25°C and output current of 200 mA
  8) With resistive load
  9) With light/dark time ratio of 1:1
  10) Do not distort cable below 0°C
  11) Continuous temperature in excess of +80°C can affect the service life of electronic components



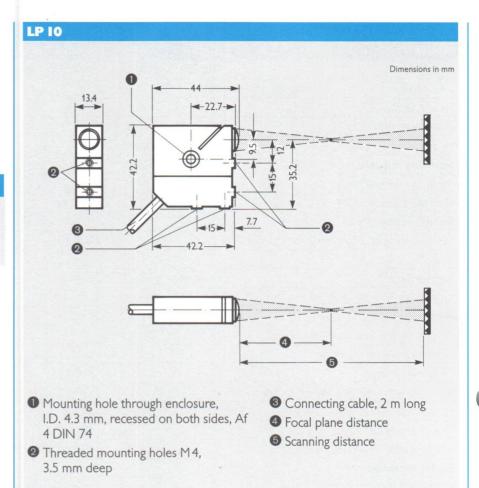


650 mm

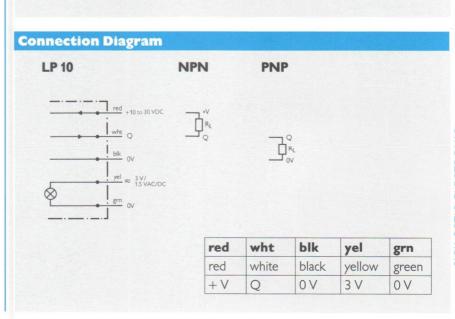


#### **Features**

- Supply connections reversepolarity protected
- NPN or PNP transistor outputs
- Built-in switching amplifier
- Light- or dark-switching
- Die-cast metal housing
- For ambient temperatures up to + 100 °C



Fork reflector (accessories), Part No. 1001143 Sender lamp 1.5 V / 0.5 W (accessories), Part No. 1000 444 Sender lamp 3 V / 0.7 W (accessories), Part No. 1002 802 Mounting rail with clamp (accessories), Part No. 1000 664



# **LP 10 Photoelectric Reflex Switch**

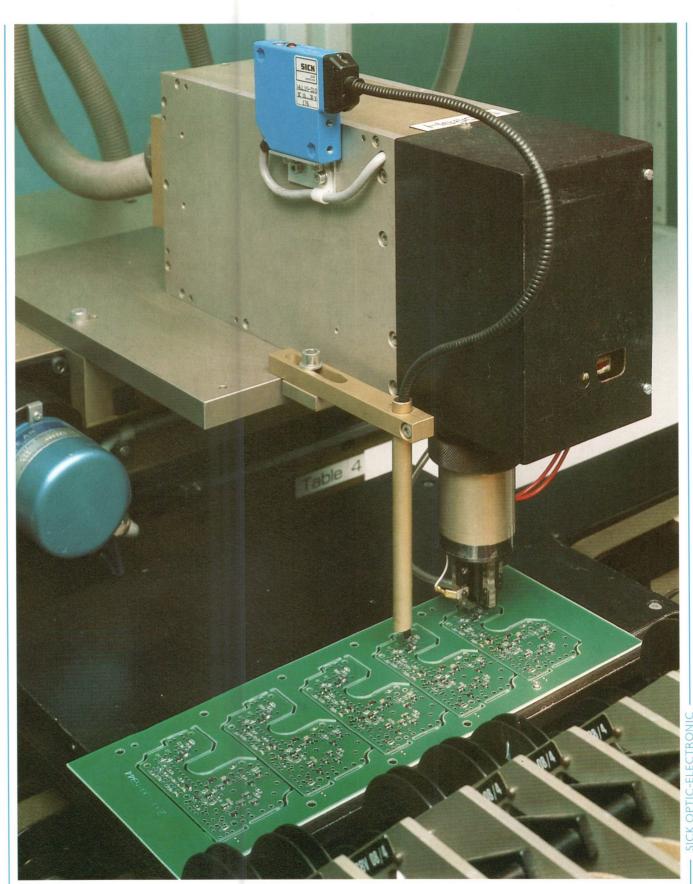
LP I	-3.	-4.	-5.	-6.
Part No.	see Selection Table			
Type of connection	cable			
Focal plane distance				
With objective lens No. 2	approx. 33 mm			
With objective lens No. 3	approx. 90 mm			
With objective lens No. 4	approx. 650 mm			
Scanning distance	see Selection Table	e		
Supply voltage V <sub>S</sub>	10 to 30 VDC <sup>1)</sup> fo	r amplifier, 3 V or 1.	5 VAC/DC for send	er lamp
Current consumption of amplifier <sup>2)</sup>	≦18 mA		≦12 mA	≦18 mA
Light source <sup>3)</sup>	incandescent lamp	, visible light, white,	average service life 8	80,000 h
Power consumption of sender lamp	0.7 VA at 3 V; 0.45	5 VA at 1.5 V		
Light spot dimensions <sup>4)</sup>				
With objective lens No. 2	approx. 2 x 1 mm <sup>2</sup>			
With objective lens No. 3	approx. 4 x 2 mm <sup>2</sup>	2		
With objective lens No. 4	approx. 22 x 11 mi	m <sup>2</sup>		
Light receiver switching mode	light-switching	dark-switching	light-switching	dark-switching
Switching output	NPN		PNP	
Signal voltage HIGH	$V_{s} - 0.7 V$		V <sub>s</sub> - 1.0 V	
Signal voltage LOW <sup>5)</sup>	≦1.0 V		≦0.7 V	
Output current max.	200 mA			
Response time <sup>6)</sup> ; switching frequency <sup>7)</sup>	≤50 µs;≤10,000/	S		
Enclosure rating	IP 64			
Circuit protection	reverse-polarity pr	rotected		
Ambient operating temperature <sup>8) 9)</sup>	−20 to +100°C			
Storage temperature <sup>8)</sup>	−25 to +100°C			
Connecting cable	$2 \text{ m}, 5 \times 0.25 \text{ mm}^2$	flex, PVC, O.D. 5 n	nm, screened signal o	core
Weight	130 g			
1) Limit values, ripple ≤ 3 V <sub>pp</sub> 2) (No load) 3) Either 3 V lamp (Part No 1002 802) or	5) At room temperature = output current of 100 m/			erature in excess of +80°C ce life of electronic compon

<sup>3)</sup> Either 3 V lamp (Part No 1002 802) or 1.5 V (Part No. 1000 444) may be used 4) At focal plane distance

<sup>10)</sup> L = light-switching; D = dark-switching

Selection '	Table				Scanning distance	e max., with r	reflector
Model	Part No.	Objective lens No.	Switching outputs	L/D10)	SC 12 / SC 40	PL 26	PL 50
LP 10-3211	1006225	2	NPN	L	55 mm	_	
LP 10-5211	1006233	2	PNP	L	55 mm	-	
LP 10-6211	1006237	2	PNP	D	55 mm	-	
LP 10-3311	1006226	3	NPN	L	95 mm	330 mm	440 mm
LP 10-4311	1006230	3	NPN	D	95 mm	330 mm	440 mm
LP 10-5311	1006234	3	PNP	L	95 mm	330 mm	440 mm
LP 10-6311	1006238	3	PNP	D	95 mm	330 mm	440 mm
LP 10-3411	1006227	4	NPN	L		650 mm	650 mm
LP 10-4411	1006231	4	NPN	D		650 mm	650 mm
LP 10-5411	1006235	4	PNP	L		650 mm	650 mm
LP 10-6411	1006239	4	PNP	D		650 mm	650 mm

<sup>6)</sup> With resistive load
7) With light/dark time ratio of 1:1
8) Do not distort cable below 0°C



122 WLL 10 photoelectric fiber-optic switch detecting incorrect markings

# Photoelectric Reflex Switches with Plug-In Fiber-Optic Cables

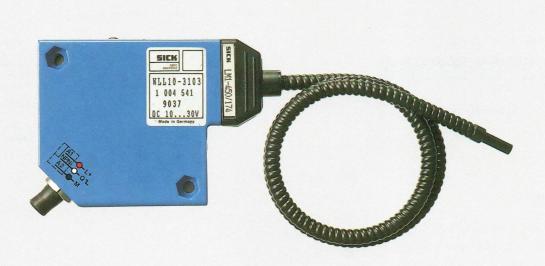
**WLL 10** 



200 mm



40 mm



Photoelectric switches in die-cast metal housing with mounting bracket. With sensitivity control and status indicator.

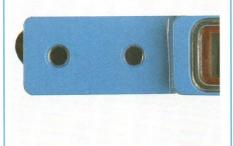
Non-detachable cable, enclosure rating IP 67 (dusttight, watertight). Supply voltage from 10 to 30 VDC.

Light- or dark-switching. Transistor outputs in NPN or PNP configuration, short circuit protected.

Photoelectric switch with infrared light; photoelectric proximity switch with infrared and visible red light.

WLL 10 photoelectric switch with interchangeable fiber-optic cables. Fiber-optic cables available for temperatures up to +250 °C.

Available as through-beam photoelectric switch, photoelectric reflex switch, photoelectric proximity switch and as photoelectric switch with plug-in fiber-optic cables.



In addition to mounting bracket, threaded mounting holes M4.



Top part with sensitivity control, power indicator and alignment sight.

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30 to 200 mm

For through-beam applications

#### **Scanning Distance**

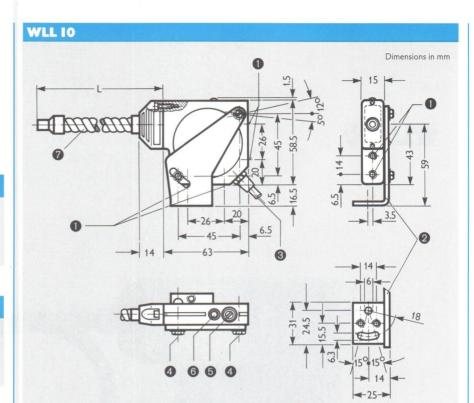


0.5 to 40 mm

For proximity applications

#### **Features**

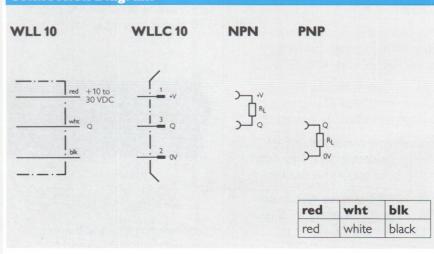
- Fiber-optic cables in 1 or 2 tip configurations of various lengths
- Fiber-optic cables with metal jacket, with or without PVC covering
- Built-in switching amplifier
- Light- or dark-switching (depending upon model used)
- Switching outputs short circuit protected, PNP or NPN
- Insensitive to ambient light
- Adjustable sensitivity
- Die-cast housing



L = Length of fiber-optic cable; see Selection Table, page 126

- 1 Threaded mounting holes M4, 4.5 mm deep
- 2 Mounting bracket (included)
- 3 Connecting cable, 3 m long
- 4-mm mounting holes through enclosure, recessed on both sides for M4 hex nut
- Sensitivity control
- 6 Signal strength indicator
- 7 Fiber-optic cable (to be ordered separately); see page 126

#### **Connection Diagram**



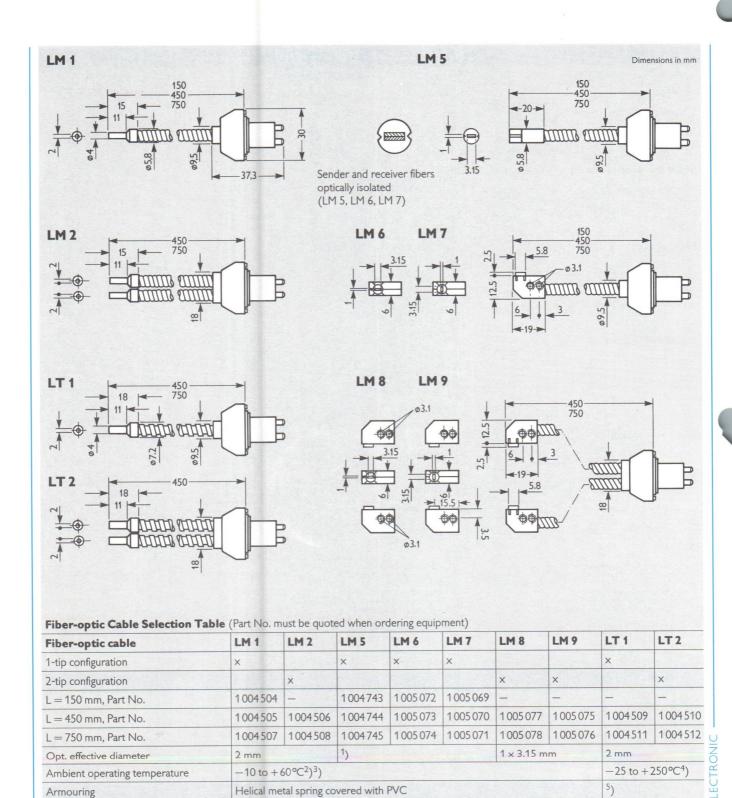
# WLL 10 Photoelectric Fiber-optic Switch

WLL 10	-3103	-3203	-7303	-7403	-9103	-9203	-9303	-9403	
With plug-in fiber-optic cables									
Part No.	1004541	1004542	1004539	1004540	1004543	1004544	1004537	1004538	
Type of connection	cable								
<b>Scanning range</b> for white standard <sup>1</sup> )	0.5 to 20 r	mm	0.5 to 5 m	m	0.5 to 20 r	nm	0.5 to 5 m	m	
for 7610 reflective tape	1 to 40 mi	m	1 to 10 mi	m	1 to 40 mr	m	1 to 10 mr	n	
Scanning distance for through-beam applic.	200 mm		30 mm		200 mm		30 mm		
Supply voltage V <sub>S</sub> <sup>2</sup> )	10 to 30 V	DC (limit va	alues)						
Current consumption (no load)	≦28 mA								
Ripple <sup>3</sup> )	≦5 V <sub>PP</sub>								
Light source	LED, avera	age service li	fe 100,000	h <sup>4</sup> )					
Type of light	infrared		red		infrared		red		
Angle of dispersion	65°								
Light receiver switching mode <sup>5</sup> )	L	D	L	D	L.	D	L	D	
Signal strength indicator	LED (red)								
Switching output	NPN PNP								
Signal voltage HIGH	V <sub>S</sub>				V <sub>S</sub> (-1.5 V)				
Signal voltage LOW <sup>6</sup> )	≦1.5 V				OV				
Output current max.	150 mA								
Response time <sup>7</sup> ); switching frequeny max. <sup>8</sup> )	<500 μs;	1000/s	<200 µs; 2	2500/s	<500 μs; 1	1000/s	<200 µs; 2	2500/s	
Enclosure rating <sup>9</sup> )	IP 67								
Circuit protection	V <sub>S</sub> input re	everse-polar	ity protected	d; transistor	output shor	t-circuit pro	tected		
Voltage V <sub>S</sub> /housing, max.	60 V								
Ambient operating temperature <sup>10</sup> )	0 to +55°	С	-25  to  + 5	55°C					
Storage temperature <sup>10</sup> )	-25  to  + 7	70°C							
Connecting cable	3 m, 3 × 0.	25 mm <sup>2</sup> flex	, PVC, O.D	. 5 mm, scre	ened signal	core			
Weight <sup>11</sup> )	360 g								
1) The scanning range is reduced for diffusely reflecting materials with a low reflectance 2) Switching devices for mains connection available on request 3) Must be within Vs tolerances 4) At room temperature = +25 ℃ 5) L = light-switching, D = dark-switching	and output 7) With resi 8) With light 9) Only with 10) Do not di 11) Including	temperature = - ut current of 10i stive load t/dark time ratio ifiber-optic cab stort cable belo connecting cabli ding fiber-optic	0 mA o of 1:1 le or protective w 0°C e and mounting						

WLL 10 with 4-pin cable	plug and 110 mm	intermediate cable length
-------------------------	-----------------	---------------------------

Model	Part No.	Corresponding opto-electronically to:	
WLLC 10-910	1005397	WLL 10-9103	
WLLC 10-920	1 005 398	WLL 10-9203	
WLLC 10-930	1005395	WLL 10-9303	
WLLC 10-940	1005396	WLL 10-9403	

Part No.	
6004538	
2006748	
2006749	
6 0 0 1 4 4 7	
6 0 0 1 4 4 8	
	6004538 2006748 2006749 6001447



20 mm

63 g

102 g

18 g

36 g

55 g

L = 150 mm, weight approx.

L = 450 mm, weight approx.

L = 750 mm, weight approx.

Min. bending radius

18 g

36 g

63 g

102 g

63 g

102 g

40 g

60 g

71 g

112 g

18 g

36 g

55 g

18 g

36 g

55 g

<sup>1)</sup>  $0.5\times3.15$  mm, sender and receiver fibers separate 2) Not to be loaded mechanically outside ambient temperature range 3) Do not distort cable below 0 °C

<sup>55</sup> g Watch equipment temperature: metal jacket can transmit heat. Cooling should be provided where appropriate.
 Chromium-plated helical metal spring

# W 260 Series **Photoelectric Switches**



Photoelectric switches in glassfiberreinforced plastic housing. Throughbeam photoelectric with great scanning distance; photoelectric reflex switch with polarizing filter; photoelectric proximity switch with great scanning distance.

With LED status indicator to facilitate set-up and alignment.

With terminal chamber and twoposition cable entry gland.

Supply voltage ranges from 10 to 30 VDC or 12 to 240 VDC/24 to 240 VAC, allowing the sensor to be used for a great variety of switching and controlling applications.

Overcurrent, short circuit and reverse-polarity protected; no false triggering on power-up.

Insensitive to ambient light through interference pulse suppression. Electrical and optical imminentfailure signalling. (DC) Light- or dark-switching, switchselectable.

Time delays adjustable from 0.1 to 5 s; OFF-delay, ON-delay, ONE SHOT or no delay (NORMAL) selectable on AC model.



Time delay control, mode selector and sensitivity control

Slotted masks to detect small objects or to increase the operating precision.



Two-position entry gland and terminal chamber

SICK OPTIC-ELECTRONIC





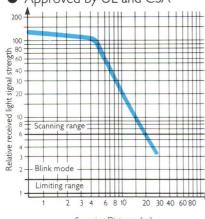
20 m



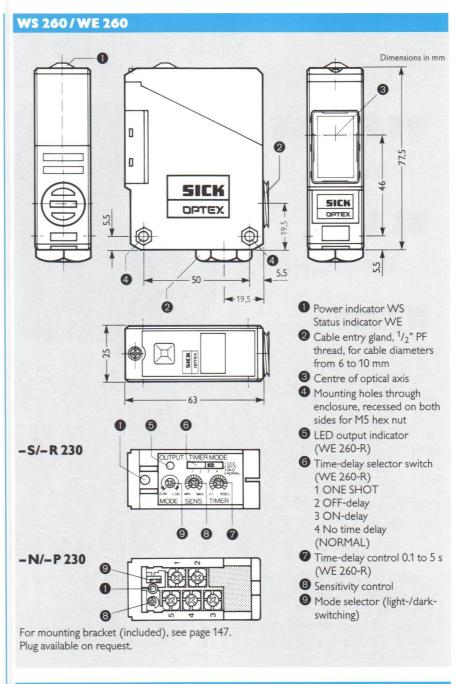
#### Features:

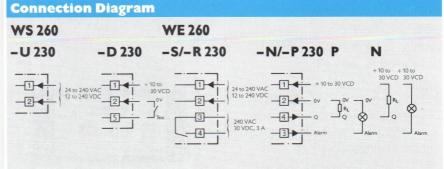
- Adjustable sensitivity
- Blinking LED status indicator to show misalignment (DC)
- Switch-selectable time delays (AC)
- Output to signal dirt build-up on optics (DC)
- Light- or dark-switching, switchselectable
- AC or AC/DC supply voltage ranges
- Two-position cable entry gland (90° apart)
- Glassfiber-reinforced plastic housing
- Transistor outputs, overload and short circuit protected
- Test input to test sensor on demand from remote location (DC)

Approved by UL and CSA



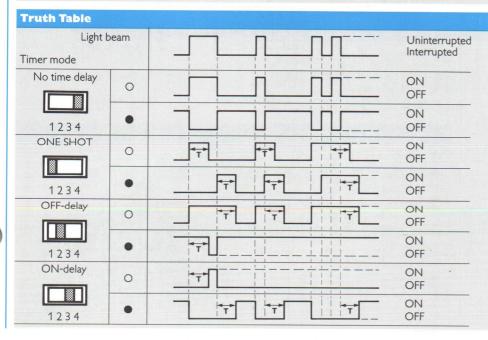






# WS 260/WE 260 Through-beam Photoelectric Switch

WS/WE 260	WS 260 Sende	r	WE 260 R	eceiver			
Model	-U 230	-D 230	-S 230	-R 230	-P 230	-N 230	
Part No.			60088731)	60088721)	6008 9501)	6008 9511)	
Type of connection	terminal chamber						
Scanning distance SD	20 m						
Light spot diameter <sup>2)</sup>	350 mm						
Supply voltage V <sub>S</sub>	12 to 240 VDC <sup>3</sup> ) 24 to 240 VAC <sup>3</sup> )	10 to 30 VDC	12 to 240 VD 24 to 240 VA	(C <sub>3</sub> ),	10 to 30 VDC		
Current/power consumption (no-load)	≦1VA	≦ 35 mA	≦2 VA		≦35 mA		
Ripple max. <sup>4)</sup>		5 V <sub>PP</sub>			5 V <sub>PP</sub>		
Light source	LED, infrared, mod	dulated, average	service life 100	.000 h <sup>5</sup> )			
Light receiver switching mode		TENTENE TH		vitching, switch-s	electable		
Switching output			relay, 1 × NO, electrically isolated		PNP open collect.	NPN open collect	
Signal voltage HIGH					V <sub>S</sub> (≦1 V)	approx. V <sub>S</sub>	
Signal voltage LOW					approx. O V		
Output current max.			3 A/240 VAC 3 A/ 30 VDC	100 mA (200			
Alarm output (static)					100 mA (200	mA) <sup>6)</sup>	
Test input T <sub>I</sub>	-	light source disconnected	-				
Response time; switching frequency max.			20 ms; 25/s		1 ms: 500/s		
Time delay with LED output indicator	_			switch- selectable	_		
Switch position	-		-	OFF-delay, ON-delay, ONE SHOT, no delay (NORMAL)	-		
Delay adjustable from				0.1 to 5 s			
Enclosure rating	IP 66						
Circuit protection <sup>7)</sup>	A		A, C		A, B, C		
Ambient operating temperature	-25 to +55°C			Profesional			
Storage temperature	-40 to +70°C						
Weight	approx. 120 g						
Package contains sender and receiver     At scanning distance SD     ± 10 %	4) Must be within Vs to 5) At room temperatur 6) Maximum current fr and alarm output: 20	re = +25°C om switching output	В	= supply connections = output Q overcurn = Interference suppr	ent and short circui	rotected t protected	



O light-switching

■ dark-switching

T = 0.1 to 5 s



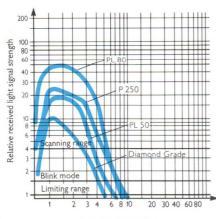


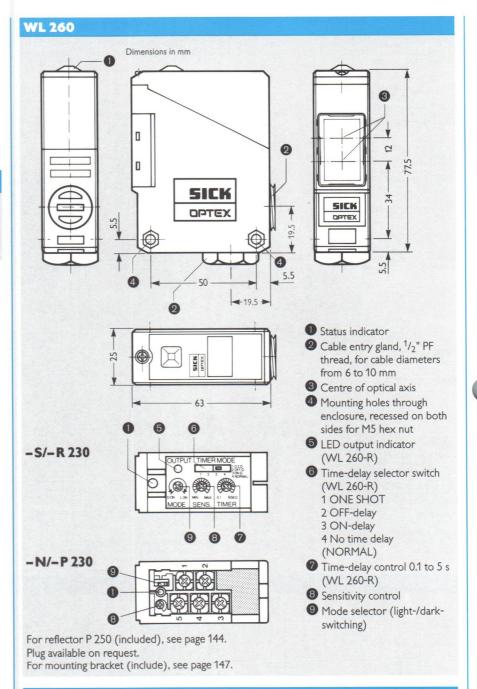
0.01 to 5 m

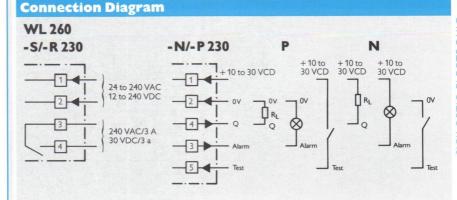


#### **Features**

- Polarizing filter, enabling objects even with reflecting surfaces to be detected
- Light- or dark-switching, switchselectable
- Adjustable sensitivity (DC)
- Blinking LED status indicator to show misalignment
- Switch-selectable time delays (AC)
- Output to signal dirt build-up on optics (DC)
- AC or AC/DC supply voltage ranges
- Two-position cable entry gland (90° apart)
- Glassfiber-reinforced plastic housing
- Transistor outputs, overload and short circuit protected
- Test input to test sensor on demand from remote location (DC)
- Approved by UL and CSA

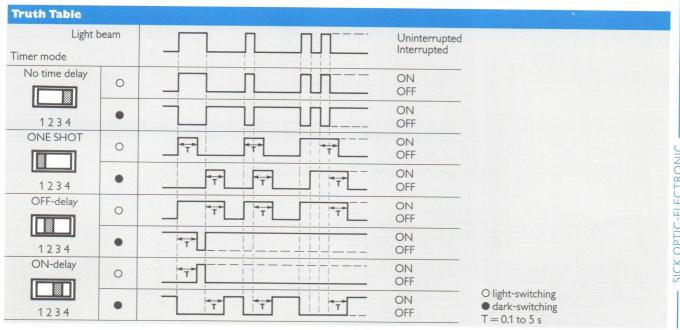






# **WL 260 Photoelectric Reflex Switch**

WL 260	-S 230	-R 230	-P 230	-N 230		
Part No.	6008773	6008772	6008 952	6008953		
Type of connection	terminal chamber					
Scanning range SR with reflector P 250	0.01 to 5 m					
Light spot diameter <sup>1)</sup>	150 mm					
Supply voltage V <sub>S</sub>	12 to 240 VDC <sup>2</sup>	), 24 to 240 VAC <sup>2)</sup>	10 to 30 VDC			
Current/power consumption (no-load)	≦2 VA		≦35 mA			
Ripple max. <sup>3)</sup>			5 Vpp			
Light source	LED, visible red	light, modulated, average serv	rice life 100.000 h 4)			
Light receiver switching mode		hing, switch-selectable				
Switching output	relay, 1 x NO, el	ectrically isolated	PNP open collect.	NPN open collect.		
Signal voltage HIGH	-		V <sub>S</sub> (≦1 V)	approx. V <sub>S</sub>		
Signal voltage LOW	-		approx. O V ≤1 V			
Output current max.	3 A/240 VAC; 3	A/30 VDC	100 mA (200 mA) <sup>5)</sup>			
Alarm output (static)	-		100 mA (200 mA) <sup>5)</sup>			
Test input T <sub>I</sub>	-		light source disconne	ected		
Response time; switching frequency max.	20 ms; 25/s		1 ms; 500/s			
Time delay with LED output indicator	_	switch-selectable	_ ,			
Switch position	-	OFF-delay, ON- delay, ONE SHOT, no delay (NORMAL)	-			
Delay adjustable from		0.1 to 5 s				
Enclosure rating	IP 66					
Circuit protection <sup>6)</sup>	A, C		A, B, C			
Ambient operating temperature	-25 to +55°C					
Storage temperature	-40 to +70°C					
Weight	approx. 120 g					
1) With scanning range SR 2) ± 10 % 3) Must be within V <sub>S</sub> tolerances	4) At room temperate 5) Maximum current and alarm output:	from switching output	A = supply connections reverse-polarity protected     B = output Q overcurrent and short circuit     protected     C = Interference suppression			







# Adjustable Scanning Distance

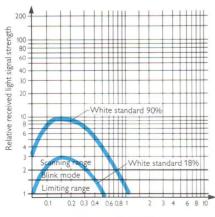


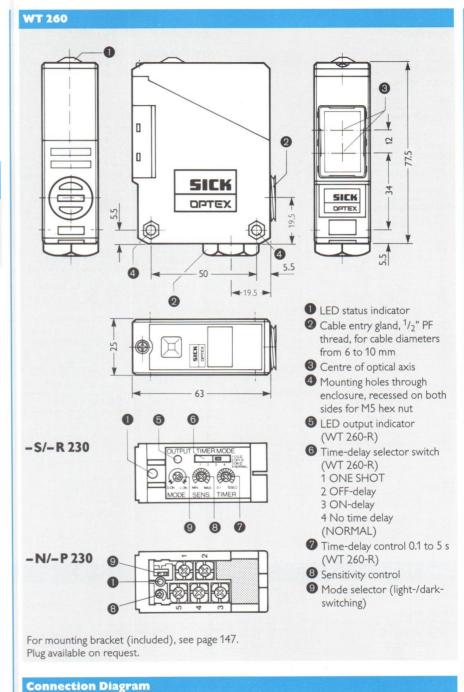
800 mm

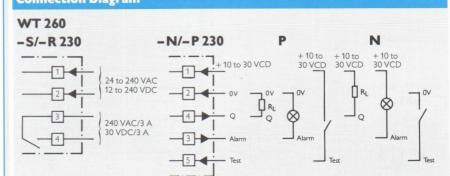


#### Features:

- Adjustable scanning distance
- Light- or dark-switching, switchselectable
- Blinking LED status indicator to show misalignment (DC)
- Switch-selectable time delays (AC)
- Output to signal dirt build-up on optics (DC)
- DC or AC/DC supply voltage ranges
- Glassfiber-reinforced plastic housing
- Two-position cable entry gland (90° apart)
- Transistor outputs, overload and short circuit protected
- Test input to test sensor on demand from remote location
- Approved by UL and CSA





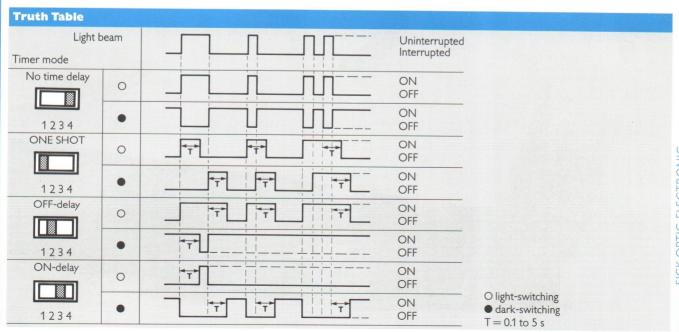


# WT 260 **Photoelectric Proximity Switch**

WT 260	-S 230	-R 230	-P 230	-N 230			
Part No.	6008775	6008774	6008 954	6008955			
Type of connection	terminal chamber						
Scanning distance SD, adjustable <sup>1)</sup>	800 mm						
Light spot diameter <sup>2)</sup>	15 mm	15 mm					
Supply voltage V <sub>S</sub>	12 to 240 VDC	<sup>3)</sup> , 24 to 240 VAC <sup>3)</sup>	10 to 30 VDC				
Current/power consumption (no-load)	≦2 VA		≦35 mA				
Ripple max. <sup>4)</sup>			5 V <sub>PP</sub>				
Light source	LED, infrared, a	verage service life 100.000 h 5)					
Light receiver switching mode		ching, switch-selectable					
Switching output		lectrically isolated	PNP open collect.	NPN open collect			
Signal voltage HIGH			V <sub>S</sub> (≦1 V)	approx. V <sub>S</sub>			
Signal voltage LOW	-		approx. O V	≤1 V			
Output current max.	3 A/240 VAC; 3	A/30 VDC	100 mA (200 mA) <sup>6)</sup>				
Alarm output (static)			100 mA (200 mA) <sup>6)</sup>				
Test input T <sub>I</sub>			light source disconnected				
Response time; switching frequency max.	20 ms; 25/s		1 ms; 500/s				
Time delay with LED output indicator	_	switch-selectable	_				
Switch position	-	OFF-delay, ON- delay, ONE SHOT, no delay (NORMAL)	-				
Delay adjustable from		0.1 to 5 s					
Enclosure rating	IP 66						
Circuit protection <sup>7)</sup>	A, C		A, B, C				
Ambient operating temperature	-25 to +55°C						
Storage temperature	-40 to +70°C						
Weight	approx. 120 g						
1) Based on white standard 90% 2) At scanning distance SD 3) ± 10 %	6) Maximum current from switching output and alarm output: 200 mA 7) A = supply connections reverse-polarity protected B = output Q overcurrent and short-circuit protected						

4) Must be within V<sub>S</sub> tolerances 5) At room temperature = +25°C

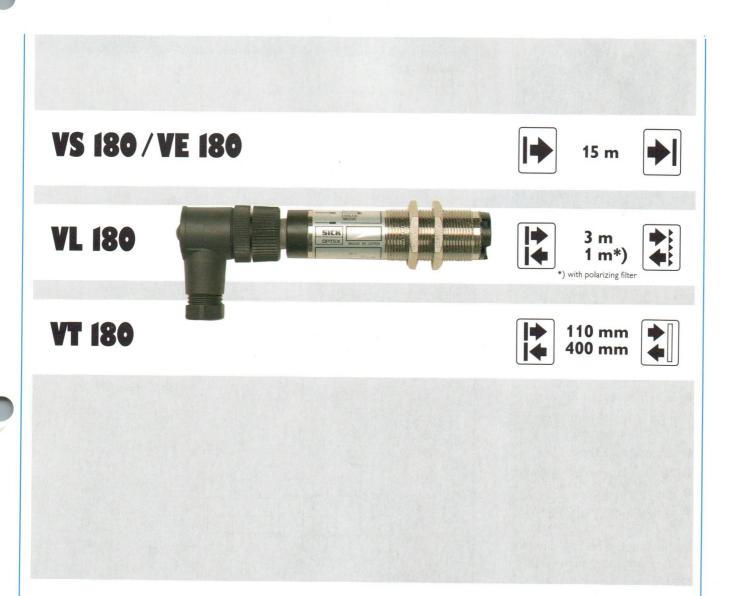
C = Interference suppression





134 VT 180 photoelectric proximity switch detecting the packing and controlling glue spreading in the next operation

# V 180 Series Photoelectric Switches



Photoelectric switches of cylindrical design in threaded metal housing, M 18 x 1.

Small-size, compact design.

Signal strength indicator for easy commissioning and adjustment.

Over-current and reverse-polarity protected; no false triggering on power-up.

Due to interference suppression insensitive to ambient light.

Photoelectric reflex switch with infrared light (scanning distance: 3 m) or visible red light and polarizing filter (scanning distance: 1 m).

Photoelectric proximity switch with optimized scanning distance: 110 mm or 400 mm.



Status indicator and sensitivity control

Available as through-beam photoelectric switch, as photoelectric reflex switch and as photoelectric proximity switch.



Plug for individual cable length and flexibility

135



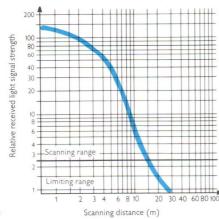


15 m



#### Features:

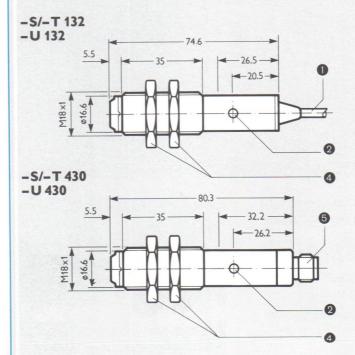
- Supply connections reversepolarity protected
- LED indicator for receiving status, on VS: power indicator
- Built-in switching amplifier
- Light- and dark-switching (L/D control wire), (DC)
- Adjustable sensitivity (VE), (DC)
- No false triggering on power-up
- Metal housing
- Output with over-current protection
- Test input to test the device and the complete system (DC)
- With connecting cable or plug
- Simple fitting
- Right-angle adapter (accessories)



# VS 180 / VE 180 -N/-P 132 -D 132 -N/-P 430 -D 430 5.5 30 63.3 15.2 9.2 -N/-P 430 -D 430 5.5 30 69 14.9 14.9

3

4



- Connecting cable
- 2 Signal strength indicator on VE 180 (power indicator on VS 180)
- 3 Sensitivity control (279°-potentiometer) on VE 180 (DC only)
- 4 Mounting nuts
- 6 Plug (for cable receptacles, see: Accessories, page 150)

For right-angle adapter (accessories), Part no. 1009 707, see page 152.

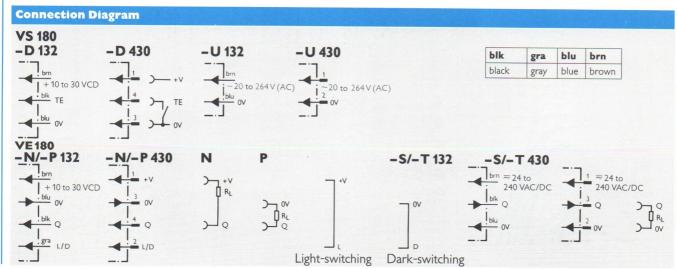
# VS 180 / VE 180 Through-beam **Photoelectric Switch**

Through-beam Photoelectric Switch	VS 180 Sende	VS 180 Sender		VE 180 Receiver				
Model with connecting cable	-D 132	-U 132	-N 132	-P 132	-S 132	-T 132		
Part No.			6008 8651)	60088641)	6008 9431)	6008 9441		
Model with plug	-D 430	-U 430	-N 430	-P 430	-S 430	-T 430		
Part No.			60088671)	60088661)	6008 9451)	6008 9461		
Scanning distance <sup>2)</sup>	15 m					10000,10		
Light spot diameter <sup>3)</sup>	800 mm							
Supply voltage V <sub>s</sub> <sup>4)</sup>	10 to 30 VDC	20 to 264 VAC	10 to 30 VD	Company	20 to 264 VAC			
Power consumption	≦25 mA	≦5 mA	≤ 25 mA (w	ithout load)	≤5 mA			
Ripple max. <sup>5)</sup>	5 V <sub>pp</sub>	_	5 V <sub>pp</sub>					
Light source		odulated, average		0.000 h <sup>6</sup> )				
Light receiver switching mode	-	light- and dark-switching, (L/D control wire 7)		dark- switching	light- switching			
Sensitivity			adjustable		-			
Status indicator	LED							
Switching outputs			NPN <sup>8)</sup>	PNP8)	FET			
Signal voltage HIGH			approx. V <sub>s</sub>	V <sub>s</sub> -(≦1 V)				
Signal voltage LOW			≦1 V	approx. 0 V	CHARLETT.			
Output current max.			100 mA		250 mA <sup>9)</sup>			
Response time; switching frequency, max.			1.5 ms; 333/s	s .	15 ms; 33/s	7 (1 ) (1 ) (1 ) (1 ) (1 ) (1 ) (1 ) (1		
Test input	light source disconnected	-						
Enclosure rating	IP 66							
Circuit protection <sup>10)</sup>	Α		A, B, C		B, C			
Ambient operating temperature	-25 to +55°C							
Storage temperature	-40 to +70°C							
Connecting cable	2 m, 3 x 0.34 mm <sup>2</sup> PVC Ø 5 mm	2m,2×0.34mm <sup>2</sup> PVC Ø 5 mm	2 m, 4 x 0.34 PVC Ø 5 mm		2 m, 3 x 0.34 PVC Ø 5 mm			
Weight with connecting cable	125 g							
Weight with plug	65 g							
The Part No. includes sender and receiver unit     The scanning range is reduced by about 20% with right-angle adapter	5) Must be within V <sub>s</sub> t 6) At room temperatu 7) Control wire open	ire = +25°C		8) Open collector 9) A/10 ms f=5 H 10) A=V <sub>s</sub> connect	Z			

- with right-angle adap 3) At scanning distance 4) Limit values

- Control wire open NPN: light-switching PNP: dark-switching

- 10) A = V<sub>s</sub> connections reverse-polarity protected B = output over-current protected C = interference suppression





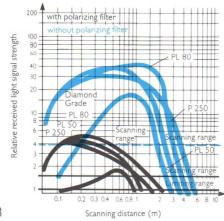


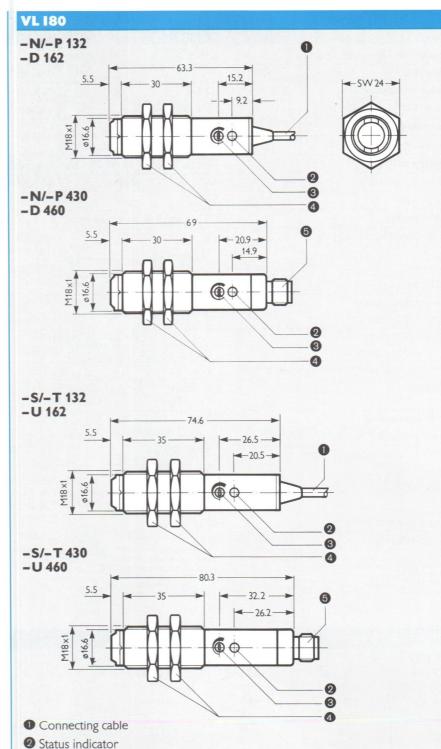
3 m 1 m\*) \*) with polarizing filter



#### **Features**

- Polarizing filter, enabling objects even with reflecting surfaces tobe detected
- Supply connections reversepolarity protected
- LED status indicator
- Built-in switching amplifier
- Light- and dark-switching (L/D control wire)
- Adjustable sensitivity
- No false triggering on power-up
- Metal housing
- Output with over-current protection
- With connecting cable or plug
- Simple fitting
- Right-angle adapter (accessories)





3 Sensitivity control (270°-potentiometer, not with polarizing-filter version)

For P 250 reflector (included), see page 144

6 Plug (for cable receptacle, see: Accessories, page 150)

For right-angle adapter (accessories), Part No. 1005 389, see page 152.

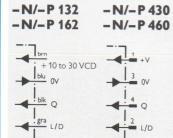
4 Mounting nuts

# **VL 180 Photoelectric Reflex Switch**

VL 180	without polarizing filter				with polarizing filter				
Model with connecting cable	-P 132	-N 132	-S 132	-T 132	-P 162	-N 162	-S 162	-T 162	
Part No.	6008779	6008780	6008 921	6008 922	6008783	6008784	6008 925	6008 926	
Model with plug	-P 430	-N 430	-S 430	-T 430	-P 460	-N 460	-S 460	-T 460	
Part No.	6008781	6008782	6008 923	6008 924	6008785	6008786	6008 927	6008 928	
Scanning distance <sup>1)</sup> with P 250 polarizing filter	0.05 to 3 i	n			0.05 to 1 m				
Light spot diameter <sup>2)</sup>	150 mm				50 mm				
Supply voltage V <sub>s</sub> <sup>3)</sup>	10 to 30 V	DC	20 to 264	VAC	10 to 30 V	DC DC	20 to 264	VAC	
Power consumption (without load)	≦30 mA		≦5 mA		≦30 mA		≦5 mA		
Ripple, max. <sup>4)</sup>	5 V <sub>pp</sub>				5 V <sub>pp</sub>				
Light source	LED, infrai	red, modular	ted <sup>5)</sup>		LED, red, modulated <sup>5)</sup>				
Light receiver switching mode	light- and o switching, (L/D cont		dark- switching	light- switching	light- and dark- switching (L/D control wire)		dark- switching	light- switching	
Switching outputs	PNP <sup>7</sup> )	NPN <sup>7)</sup>	FET		PNP <sup>7</sup> )	NPN <sup>7</sup> )	FET		
Signal voltage HIGH	V <sub>s</sub> - (≦1 V)	approx.V <sub>s</sub>	-		V <sub>s</sub> - (≦1 V)	approx. V <sub>s</sub>	-		
Signal voltage LOW	approx. 0 V	V <sub>s</sub> ≦1V	-		approx.	≦1 V	-		
Output current, max.	100 mA		250 mA <sup>8)</sup>		100 mA	Baller	250 mA <sup>8)</sup>		
Response time; switching frequency, max.	1.5 ms; 33	3/s	15 ms; 33/	's	1.5 ms; 333/s		15 ms; 33/s		
Enclosure rating	IP 66								
Circuit protection <sup>9)</sup>	А, В, С		В, С		A, B, C		B, C		
Ambient operating temperature	-25  to  + 5	55°C							
Storage temperature	-40  to  + 7	70°C							
Connecting cable	2 m, 4 x 0. PVC Ø 5 m		2 m, 3 x 0. PVC Ø 5 n		2 m, 4 x 0.34 mm <sup>2</sup> PVC Ø 5 mm		2 m, 3 × 0.34 mm <sup>2</sup> , PVC Ø 5 mm		
Weight with connecting cable	125 g								
Weight with plug	65 g								
1) The scanning distance is reduced by about 20% with right-angle adapter 2) At scanning distance 3) Limit values 4) Must be within V <sub>s</sub> tolerances		-switching	m temperature	= 25°C:	8) 1 Å/10 9) A = V <sub>3</sub> B = ou	collector ms f=5 Hz connections re utput over-curre terference supp	ent protected	protected	

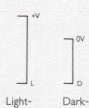
#### **Connection Diagram**



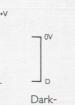


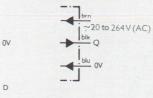




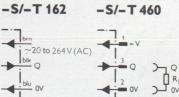


switching switching





-S/-T 132



-S/-T 430

blk	gra	blu	brn		
black	gray	blue	brown		



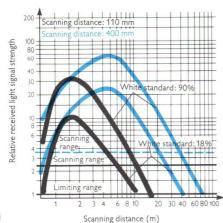


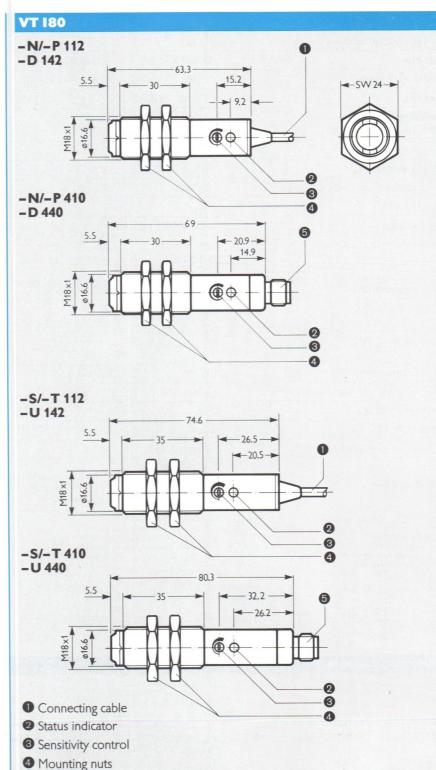
110 and 400 mm



#### **Features**

- Supply connection reversepolarity protected
- LED status indicator
- Built-in switching amplifier
- Light- and dark-switching (L/D control wire)
- Adjustable sensitivity
- No false triggering on power-up
- Metal housing
- Output with over-current protection
- With connecting cable or plug
- Simple fitting
- Right-angle adapter (accessories)





For right-angle adapter (accessories), Part No. 1005 390, see page 152.

6 Plug (for cable receptacle, see: Accessories, page 150)

# **VT 180 Photoelectric Proximity Switch**

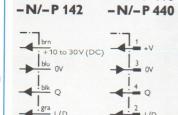
VT 180	Scannin	Scanning distance: 110 mm				Scanning distance: 400 mm			
Model with connecting cable	-P 112	-N 112	-S 112	-T 112	-P 142	-N 142	-S 142	-T 142	
Part No.	6008787	6008788	6008 929	6008 930	6008791	6008792	6008 933	6008 934	
Model with plug	-P 410	-N 410	-S 410	-T 410	-P 440	-N 440	-S 440	-T 440	
Part No.	6008789	6008790	6008 931	6008 932	6008793	6008794	6008 935	6008 936	
Scanning distance, adjustable <sup>1)</sup>	110 mm <sup>2)</sup>				400 mm <sup>2)</sup>				
Light spot diameter <sup>3)</sup>	65 mm				30 mm				
Supply voltage V <sub>s</sub> <sup>4)</sup>	10 to 30 V	DC	20 to 264	VAC	10 to 30 V	'DC	20 to 264	VAC	
Power consumption (without load)	≤ 30 mA		≦5 mA		≦30 mA		≦5 mA		
Ripple, max. <sup>5)</sup>	5 V <sub>pp</sub>				5 V <sub>pp</sub>				
Light source	LED, infra	red, modula	ted, average	service life:		)			
Light receiver switching mode	light- and switching, (L/D cont	dark-	dark- switching	light- switching	light- and switching, (L/D cont	dark-	dark- switching	light- switching	
Switching outputs	PNP8)	NPN8)	FET		PNP8)	NPN <sup>8)</sup>	FET		
Signal voltage HIGH	V <sub>s</sub> - (≦1 V)	approx.V <sub>s</sub>	-		V <sub>s</sub> - (≦1 V)	approx.V <sub>s</sub>	-		
Signal voltage LOW	approx.	V <sub>s</sub> ≦1∨	-		approx.	V <sub>s</sub> ≦1∨	-		
Output current, max.	100 mA		250 mA <sup>9)</sup>		100 mA		250 mA <sup>9)</sup>		
Response time; switching frequency, max.	1.5 ms; 33	3/s	15 ms; 33/	's	1.5 ms; 33	3/s	15 ms; 33/	S	
Enclosure rating	IP 66								
Circuit protection <sup>10)</sup>	А, В, С		В, С		A, B, C		B, C		
Ambient operating temperature	-25  to  + 5	55°C							
Storage temperature	-40  to  +7	70°C							
Connecting cable	2 m, 4 x 0. PVC Ø 5 m		2 m, 3 x 0. PVC Ø 5 m		2 m, 4 x 0. PVC Ø 5 m		2 m, 3 x 0.34 mm <sup>2</sup> , PVC Ø 5 mm		
Weight with connecting cable	125 g								
Weight with plug	65 g								
The scanning distance is reduced by about 20% with right-angle adapter	7) Control w	vire open							

- with right-angle adapter
  2) Based on white standard 90%
  3) At scanning distance
  4) Limit values
  5) Must be within V<sub>s</sub> tolerances
  6) At room temperature = 25 °C

**VT 180** -N/-P 112

- // Control wire open
  NPN = light-switching
  PNP = dark-switching
  8) Open collector
  9) 1A/10ms f=5 Hz
  10) A = Vs supply connections reverse-polarity protected
  B = output over-current protected
  C = interference suppression

#### **Connection Diagram**



-N/-P410

N

→ OV R<sub>L</sub> Q

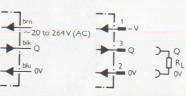


Light-

switching

7 OV

Darkswitching -S/-T 112 -S/-T 142 -S/-T 410 -S/-T 440



blk blu brn gra blue brown gray



142 Accessories for photoelectric switches: heat sinks, dust shield, mounting bracket, lens heater, reflectors, fiber-optic cable

# Accessories

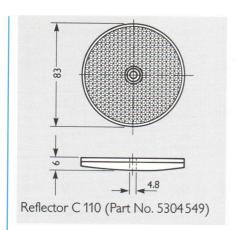
# **Selection Table** Reflectors

Description	Part No.	WL 6	WL9			WL 36	WL 45	WL 12	WL 260	LP 10	VL 18	WL 25 Ex i
C 110	5304549	0	0	0	•	•	•	0	0	0	0	
OP 60-∞	1000141						•					0
OP 61-∞, ambient temperature max. 300°C	1002627						•					0
SW 50, ambient temperature max. 300°C	1000131	0	0	0	0	•	•	0	0	0	0	•
PL 22-1 screw mounted	1003546	0	0	0	0	0	0	0	0	0	0	
PL 22-2 self-adhesive	1003621	0	0	0	0	0	0	0	0	0	0	
PL 22-3 screw mounted	1004488	0	0	0	0	0	0	0	0	0	0	
PL 26	1 001 440	0	0	0	0	0	0	•	0	•	0	
PL 30	1002314	0	•	•	•	•	•	•	•		0	
PL 31 <sup>1</sup> )	1002315	0	0	0	0	0	0	0	0	0	0	
PL 50	1000132	0	•	•	•	•	•	•	•	•	0	•
PL 50 H heated <sup>2</sup> )	1004806	0					•				0	•
PL 51 <sup>2</sup> )	1001628	0									0	
PL 53	1000382	0	0	0	0	0	0	0	0	0	0	0
PL 72	5 3 0 4 1 4 5	•										
PL 80	1 003 865		•	•	•	•	•	•	•	0	0	•
P 250	5 3 0 4 8 1 2								•		•	
"Diamond Grade" reflective tape	4019634	0	•	•	•	•	•		0	0	0	0

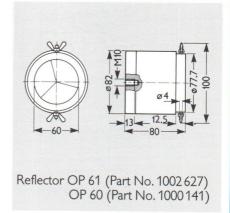
<sup>1)</sup> Reflective area equivalent to PL 30 2) Reflective area equivalent to PL 50

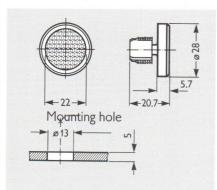
<sup>•</sup> with scanning distance details given in Technical Data O scanning distances on request

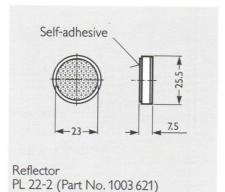
# Accessories Reflectors



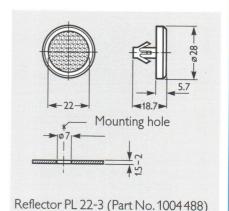




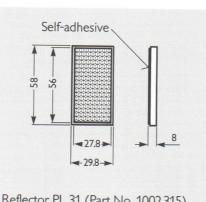


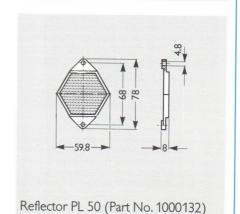


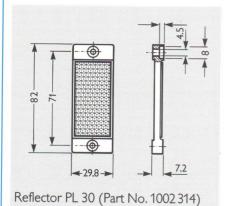
PL 26 (Part No. 1001 440)





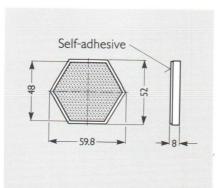






1 and 2 are jumpered 3 and 4 are jumpered





**←**50→

Snap-locking Reflector PL 50 H, heated connector with strain relief (Part No. 1004806)

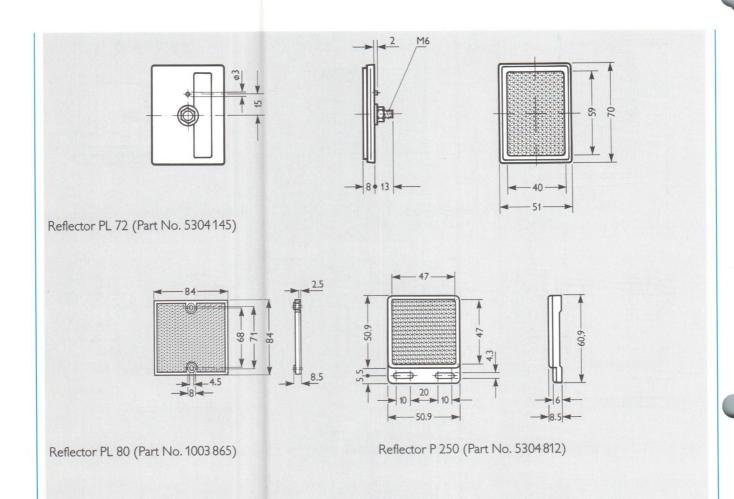
(illustrated without strain relief) = 1.4 W at 24 VAC/DC = 24 VAC/DC (+20%, -30%)

Reflector PL 51 (Part No. 1001 628)

Reflector PL 53 (Part No. 1000 382) Reflector SW 50 (Part No. 1000 131)

# SICK OPTIC-ELECTRONIC

# Accessories Reflectors



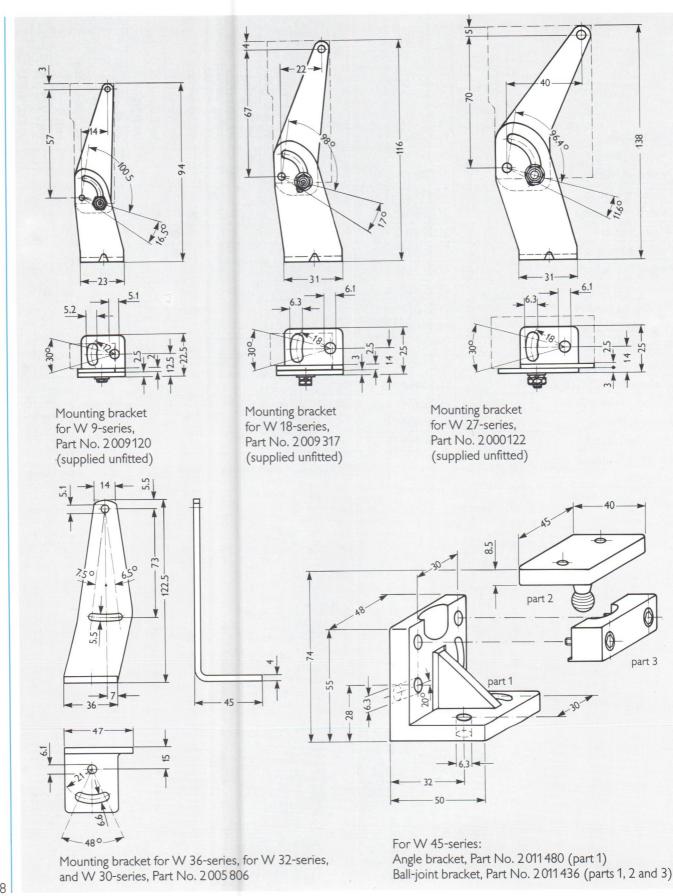
# Accessories Mounting Brackets

Description	Part No.	W 5-series	W 6-series	W 9-series	W 18-series	W 27-series	W 36-series	W 45-series	WT 32	WT 30	W 12-series	WLL 10	W 260-series	PFK 1	WL/WT 25 Exi	WSU/WEU 26
Mounting bracket	2009120			•												
Mounting bracket	2009317				•											
Mounting bracket	2009122					•										
Mounting bracket	2005806						•		•	•						
Angle bracket	2011480							•								
Ball-joint bracket	2011436							•								
Mounting bracket	4007744											<b>1</b> )				
Mounting bracket	4009080					6-9								<b>1</b> )	<b>1</b> )	
Articulated bracket	1003073											•				
Articulated bracket	1005580												9.5			
Articulated bracket	2006258															
Mounting bracket	2007900															•
Wall-mounting bracket	2010846															
Bracket for optic head	2002974															
Ball-joint bracket	2007004															
Mounting bracket	5304819												<b>1</b> )			
Mounting bracket											<b>1</b> )					
Fixing clamp											<b>1</b> )				Track Control	

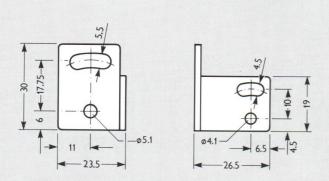
<sup>1)</sup> Included

# ICK OPTIC-ELECTBONIO

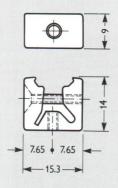
# Accessories Mounting Brackets



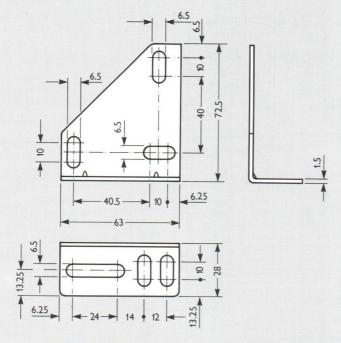
# Accessories Mounting Brackets



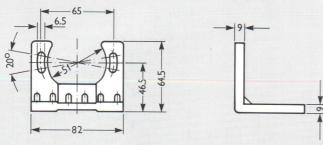
Mounting bracket for W 12-series



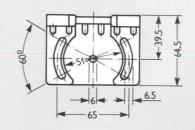
Fixing clamp for W 12-series (2 pieces required)



Mounting bracket for W 260-series (Part No. 5 304 819)



Mounting bracket for PFK 1, Part No. 4009 080 for WL/WT 25 Ex i, Part No. 4009 080 for WSU/WEU 26, Part No. 2007 900

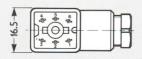


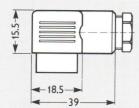
# Accessories Cable Receptacles

	Part No.	WL 18-N/-P 630	WT 18-N/-P 610	WS/WE 27-D/-N/-P 630	WS/WE 27-U/-R 630	WL 27-N/-P 630	WL 27-R	W 1 27-N-F 010	WS/WE 36-D/-N/-P 630	WS/WE 36-U/-R 630	WL 36-B 330	WS/WE 36-B 430	WL 36-B 430		WL 36-R 730, WT 36-R 710	WT 32-B 330	WT 32-B 630	WS/WE 12	WL 12	WL 12-B 5681	WT 12 VGA	WT 12 HGA	WT 12 energetic	WT 12-B 5781	VS/VE 180 (DC)	VS/VE 180 (AC)	VL 180 (DC)	VL 180 (AC)	VT 180 (DC)
Description	6006710	>		>	>	•					-	-																	
Cable receptacle, 6-pin (DC)  2 m cable with receptacle																													
and crimped leads	2009477	•	•	•		•		•																					+
3 m cable with receptacle and crimped leads	2009478	•	•	•		•	(	•																					
5.5 m cable with receptacle and crimped leads	2009479		•	•		•	(	•																					
10m cable with receptacle and crimped leads	2009480		•	•		•		•																					
Cable receptacle, 6-pin (AC/DC)	6006685				•		•						1																
2m cable with receptacle and crimped leads	2009116				•		•																						
3 m cable with receptacle and crimped leads	2009117				•		•																						
5.5 m cable with receptacle and crimped leads	2009118				•		•																						
10 m cable with receptacle and crimped leads	2009119				•		•						1																
Cable receptacle, 4-pin, to DIN 43 650	6005698											1				•													
Cable receptacle, right angle, 7-pin, to DIN 43 651	6006613																•												
Cable receptacle, straight, 7-pin, to DIN 43 651	6006612																•												
Cable receptacle, 7-pin (DC)	6006823													•															
Cable receptacle, 7-pin (AC/DC)	6006821				2										•														
Cable receptacle, right angle, 4-pin (DC)	6007303																	•	•		•						•		•
Cable receptacle, straight, 4-pin (DC)	6007302																	•	•		•						•		•
Cable receptacle, right angle, 4-pin (AC)	6007306																									•		•	
Cable receptacle, straight,	6007305																									•		•	
4-pin (AC)  Cable receptacle, right angle,	6008900																			•									
5-pin  Cable receptacle, straight, 5-pin	6008899																			•									
Cable receptacle, right angle, 7-pin	6007301																												

# **Accessories Cable Receptacles**



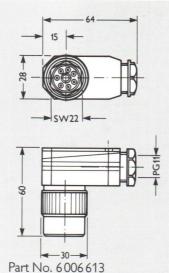




Part No. 6006710 (DC) 6006685 (AC)

PG 11

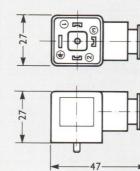
78



Right-angle cable receptacle with female crimp contacts and center screw for cable diameters from 4 to 11 mm.

Dimensions in mm

For cable diameters from 6 to 8 mm



from 5 to 11 mm

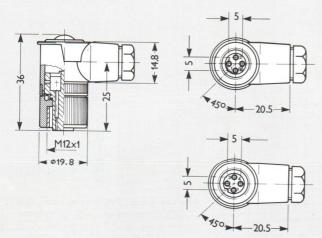
For cable diameters

Part No. 6006821 (AC/DC) 6006823 (DC)

Part No. 6006612

Part No. 6005698

For cable diameters from 4,5 to 6,5 mm



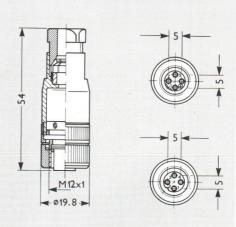
SW 22 |

Straight cable

receptacle with female crimp contacts and locking ring for cable diameters from 4 to 11 mm.

Part No. 6007303 (AC/DC) 6007306 (AC) and

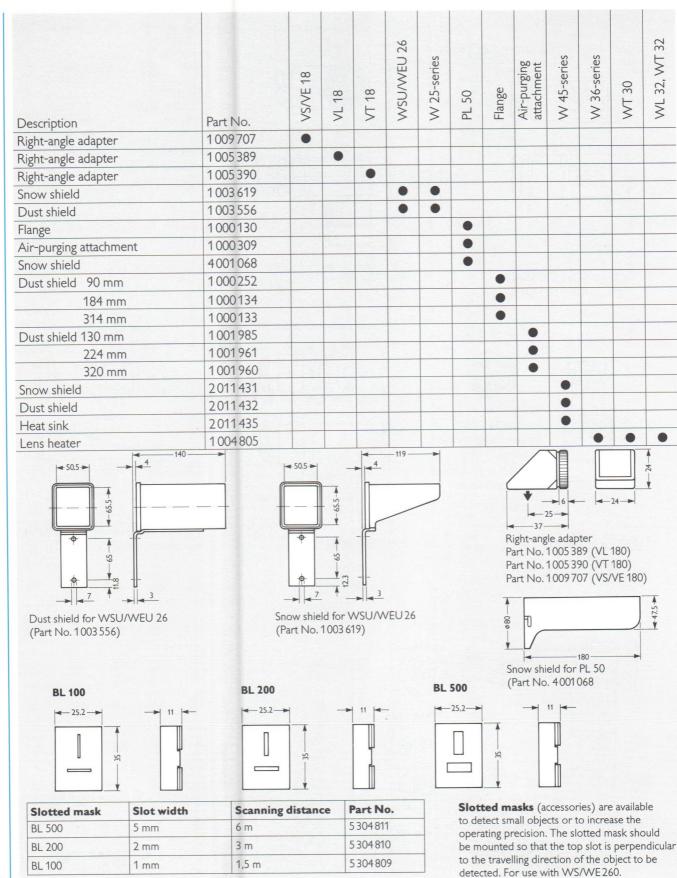
For cable diameters from 4,5 to 6,8 mm



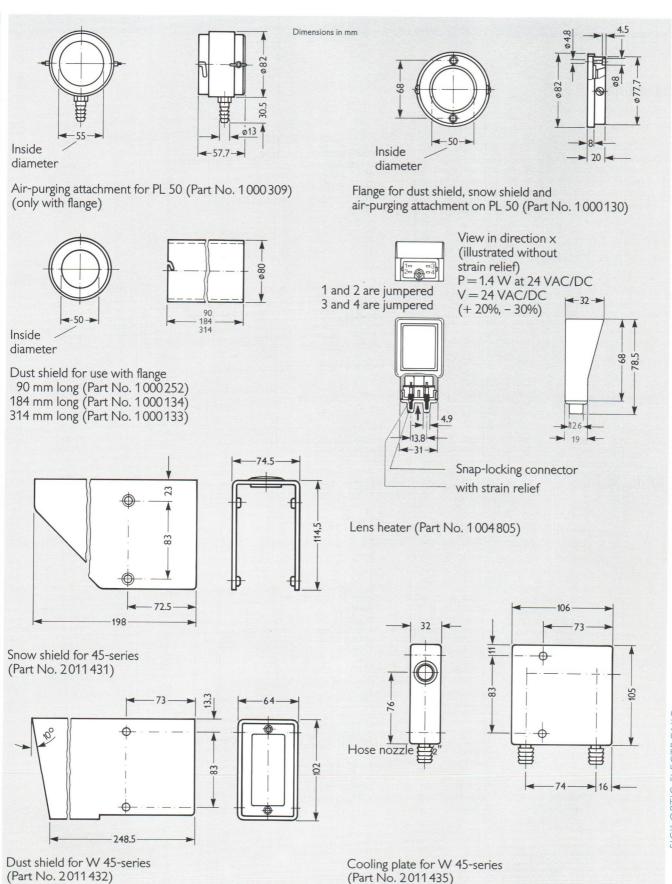
Part No. 6007302 (AC/DC) 6007305 (AC)

# SICK OPTIC-ELECTRONIC

# Selection Table Special Accessories

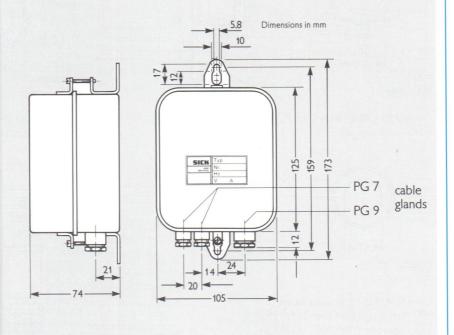


# Special Accessories

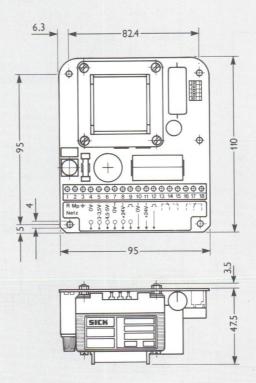


# BP/BP

### NP 06/08



### BP 06/08



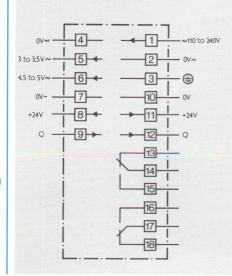
# NP/BP **Switching Amplifiers**

NP/BP	NP 06	NP 08	BP 06	BP 08						
Part No. with enclosure	1002889	1002890								
without enclosure			1002886	1002887						
Supply voltage V <sub>S</sub>	110/120/220/2	110/120/220/240 VAC (+10%, -15%)								
Set at works at	220 VAC (+10	220 VAC (+10%, -15%)								
Line frequency	48 to 62 Hz	48 to 62 Hz								
Power consumption max.	15 VA									
Output voltage	24 VDC									
Output current max.1)	200 mA									
Ripple voltage	<3 V <sub>pp</sub>									
Supply voltage (sender lamp)	1.5; 3; 3.5; 4; 5 VAC with fine adjustment									
Switching outputs	DPDT									
Switching voltage max.	250 V									
Switching current max.	3 A									
Switching power max. <sup>2</sup> )	750 VA (50 W	/³), 120 W⁴))								
Response time (only relay)	<15 ms									
Drop-out time (only relay)	<20 ms									
Triggering time, min.		0.5 ms		0.5 ms						
Time delay		fixed setting <sup>5</sup> )	-	fixed setting <sup>5</sup>						
Enclosure rating	IP 54		IP 00							
Ambient operating temperature	-20 to +65°C									
Storage temperature	-40 to +70°C									
Weight	approx. 1.1 kg		approx. 0.7 kg							
4) )4(4)										

Without using relay; 160 mA when using relay
 Provide suitable arc suppression with inductive or capacitive loads
 At 250 VDC and with resistive load
 At 40 VDC and with resistive load
 Relay hold time: min. 20 ms, max. 80 ms

## **Connection Diagram**

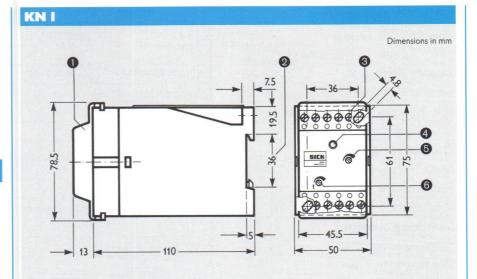
#### NP/BP 06, NP/BP 08





### **Features**

- Adjustable switching mode
- Status indicator
- Retrofittable timing element
- Adjustable time delay (20 turn helipot)
- Choice of ON-delay or OFF-delay
- Triac triggering with no-voltage switch (KN 1-2...)
- Housing for snap fixing to 35 mm track to DIN 46277
- Housing flange for direct wall mounting; fixing dimensions to DIN 43 604

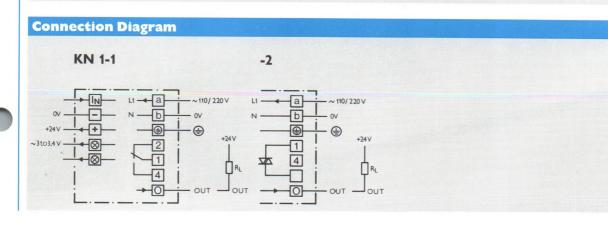


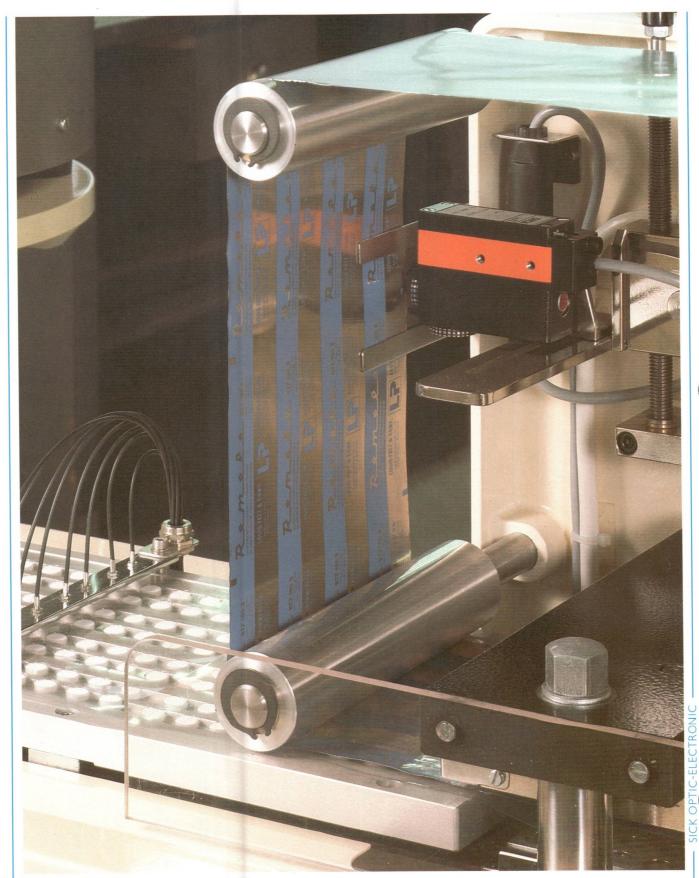
- 1 Transparent cover (accessories)
- 2 Mounted on 35 mm track to DIN 46277
- 3 Connection terminals, clamping area 2 x 2.5 mm<sup>2</sup>
- 4 Status indicator
- 6 Lamp brightness
- 6 Time delay

Model	Part No.	Time delay	Supply voltage
(N 1-102	1003 280	none	220 VAC
KN 1-112	1003 278	0.015 to 0.5 s	220 VAC
KN 1-122	1003 279	0.06 to 2 s	220 VAC
(N 1-132	1003 274	0.5 to 16 s	220 VAC
(N 1-142	1003 559	4 to 128 s	220 VAC
(N 1-101	1003 282	none	120 VAC
(N 1-111	1004929	0.015 to 0.5 s	120 VAC
KN 1-121	1004192	0.06 to 2 s	120 VAC
(N 1-131	1003 283	0.5 to 16 s	120 VAC
(N 1-125	1004656	0.06 to 2 s	120 VAC
(N 1-106	1003 832	none	110 VAC
(N 1-136	1004491	0.5 to 16 s	110 VAC
N 1-108	1004373	none	48 VAC
(N 1-138	1004369	0.5 to 16 s	48 VAC
(N 1-109	1004692	none	24 VAC
(N 1-129	1005 509	0.5 to 16 s	24 VAC
(N 1-202	1003 281	none	220 VAC
(N 1-212	1004557	0.015 to 0.5 s	220 VAC
N 1-222	1003 841	0.06 to 2 s	220 VAC
(N 1-232	1004531	0.5 to 16 s	220 VAC
KN 1-201	1004130	none	120 VAC

# KN 1 Switching Amplifier

	KN	-	-2
Supply volt	tage V <sub>s</sub>	see Selection Table	
Line frequency	/	50/60 Hz	
Power consum	nption	approx. 6 VA	
<b>Output volt</b>	age (amplifier)	24 VDC, unstabilized	
Ripple voltage		2.5 V	
Output curren	nt max.	80 mA	
Output voltage	e (sender lamp)	3 VAC	
Output curren	nt max.	0.9 A	
Switching ou	utputs <sup>1</sup> )	inverting/non-inverting, s	elected with switch S2
Relay outpu	t	SPDT	
Switching volta	age max.	250 V	
Switching curre	ent max.	4 A	
Switching pow	er max. <sup>2</sup> )	1000 VA	
At 24 VDC, m	ax.	100 W	
Switching frequ	uency max.3)	10/s	-
Triac output	;		
Switching volta	ge min.	_	48 VAC, -20%
Switching volta	ge max.		240 VAC, +10%
RMS current m	nin.		0.06 A
RMS current m	nax.		1A
Peak current m	nax.		6 A for 10 ms
Transistor o	utput		
Output voltage	HIGH	approx. 24 V (V <sub>s</sub> )	
Output voltage	LOW	≦1 V (with 10 mA output	current)
Output current	t max.	10 mA	
Time delay		plug-in	
Time-related b	ehaviour <sup>4</sup> )	ON-delay or OFF-delay, s	elected with slide switch S1
Time range		see Selection Table	
Enclosure ra	ting Housing	IP 40	
	Terminals	IP 00	
Weight	without time delay	330 g	
	with time delay	345 g	
Switch S 2 on mother     Provide suitable arc capacitive loads	er board suppression with inductive or	3) No time delay 4) Switch \$1 on "Time delay" PCB	





158 NT 8 registration control scanner controlling register marks on blister packs

# Contrast Scanners

#### The Use of Contrast Scanners

Contrast scanners work on the same principle as photoelectric proximity switches and are able to differentiate up to 15 degrees of gray on the black-to-white scale. This property is a prerequisite for reading contrast marks, e.g. colored print. Colours differ in most cases in their gray-scale values (brightness values). The readability of a mark is governed by the difference in brightness between mark and background, not the colour contrast.

#### **Mode of Operation**

A light source (LED or incandescent lamp) produces a light spot at the focal plane (scanning distance). The reflectance of this area is evaluated in the registration control scanner. The brightness value of the material surface (actual value) is continuously compared with a given threshold value (gray-scale value). As soon as the value exceeds or drops below the switching threshold, the switching output changes its status:

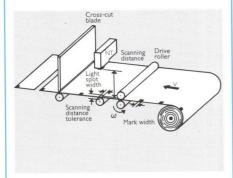


Fig. 1. A contrast scanner on a register mark-controlled cross-cut knife.

#### Fields of Application

Contrast scanners are used chiefly in the packaging industry for the register-controlled cutting of labels or packaging material (Fig. 1). Other fields of application include the positioning of cans and tubes, sorting using colored marks, positioning labels, code recognition, monitoring 160 adhesive points (with fiber-optic

models for through-beam applications), and checking the presence of "Consume by" dates.

## **Scanning Distance**

The scanning distance is the distance between the objective lens of the contrast scanner and the surface of the material. In this instance it is also the focal plane distance at which the light spot is reproduced on the material. Requirements relating to the accuracy of material delivery are governed by the scanning distance tolerance. This tolerance indicates the limits within which the scanning distance can vary in service without affecting the measured actual grayscale value. With large scanningdistance tolerances it is impossible to distinguish small differences in brightness. When fiber-optic cables are used, a precise light spot reproduction is not achieved: the light leaves the fiber-optic cable undirected, in the form of a disperse beam (Fig. 2). The scanning distance may vary when using fiber-optic cables, and the sensitivity of the system is reduced as the distance becomes greater. The size of the light spot is similarly a function of the scanning distance and can be determined from the light beam cross-section and the scanning distance.

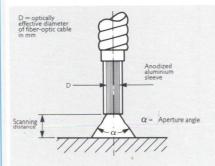


Fig. 2. The light leaves the fiberoptic cable undirected.

The switching accuracy which can be achieved is governed by the size of the light spot. The mark width required is a function of the size of

the light spot and of the feed speed. The light spot should be parallel to the long side of the mark, so that the mark passes through the complete light spot.

#### **Light Source**

Depending on the various applications involved, different light sources are used in contrast scanners: red and green light-emitting diodes, infrared diodes and incandescent filament lamps. Light-emitting diodes emit a narrow-band light spectrum: with a red light-emitting diode, for example, a white/red contrast cannot be detected. Contrast scanners incorporating LEDs are consequently fitted with switch- selectable red and green, or plug-in LED modules. Incandescent filament lamps emit a considerably wider spectrum and are consequently capable - possibly with appropriate filters - of distinguishing many color contrasts (Fig. 3).

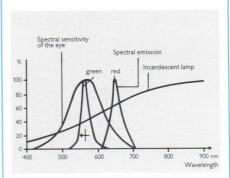


Fig. 3. Spectral distribution of green and red LEDs and of an incandescent lamp, compared with the sensitivity of the eye.

Two drawbacks are the considerably shorter life and the separate voltage supply required for the incandescent lamp. Contrast scanners incorporating fiber-optic cables are fitted with red and infrared diodes. Red light detects common markings; infrared is suitable amongst other things for detecting points of adhesion (with fiber-optic model in 2-tip configuration).

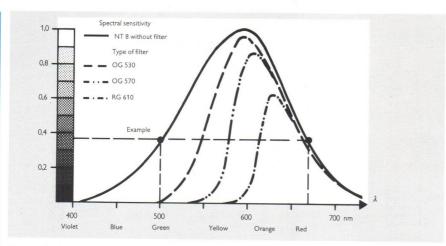


Fig. 4. Spectral sensitivity of light receiver in the NT8, with and without filter.

#### **Light Receiver**

Compared with the spectral sensitivity of the eye, the spectral sensitivity of the receiver is slightly displaced in the red direction (Fig. 4). Figs. 3 and 4 show that, with white light, a contrast scanner usually interprets the colours red and green with a similar gray-scale value. With red light, on the other hand, a red mark reflects the incident light, whereas green absorbs the red light.

## **Supply Voltage**

The supply voltage of the contrast scanner is reverse-polarity protected and can vary between the limits 10 V and 30 V. Contrast scanners with incandescent lamps require an additional supply voltage for the lamp. The voltage specified should be maintained as accurately as possible. While a lower voltage extends the life of the lamp, even slightly

		Light switchi	ing					
Mark	Status	B output			PNP output		NPN output	
- rark	indicator	Output Q	Relay P	Relay N	Output Q	Relay P	Output O	Relay N
Dark	Goes off	HIGH (active)	pulled in	dropped out	LOW	dropped out	HIGH	dropped out
Light	Lights up	LOW (active)	dropped out	pulled in	HIGH (active)	- 11	LOW (active)	11

		Dark switchi	ng					
Mark	Status	B output			PNP output		NPN output	
	indicator	Output Q	Relay P	Relay N	Output Q	Relay P	Output O	Relay N
Dark	Lights up	LOW (active)	dropped out	pulled in	HIGH (active)	pulled in	LOW (active)	,
Light	Goes off	HIGH (active)	pulled in	dropped out		dropped out	HIGH	dropped ou

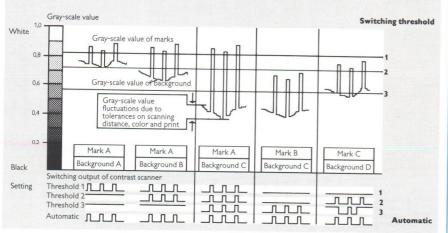


Fig. 5. Manual and automatic setting of switching threshold, and response at switching output.

exceeding the voltage will considerably reduce lamp life.

## **Switching Outputs**

Electronic switching outputs are available in NPN and PNP configurations. The electronic B output replaces both these alternatives: the type of output is then determined only by the load being connected to +V (NPN configuration) or 0 V (PNP configuration). The devices are suitable for light-switching and darkswitching modes. In the case of light-switching, current flows through the load for a light mark; with dark-switching this applies to a dark mark. The switching threshold can be adjusted with a multi-turn potentiometer, whose mode of operation is illustrated in Fig. 5.

#### **Switching Frequency**

The maximum switching frequency is obtained from the response time and release time:

$$f_{\text{max}} = \frac{1}{t_{\text{resp}} + t_{\text{re}}}$$

 $f_{max} = maximum$  switching frequency

 $t_{resp} = response time$ 

t<sub>rel</sub> = release time

#### **Response Time**

The response time determines the maximum material speed. The reaction distance can be estimated from the response time and the material speed:

 $s = v \cdot t_{res}$ 

s = reaction distance

v = material speed

t<sub>res</sub> = response time

#### **Timing Element**

The timing elements indicated represent the minimum timeelement, i.e. at each mark the output signal is extended time-wise by the minimum time indicated.

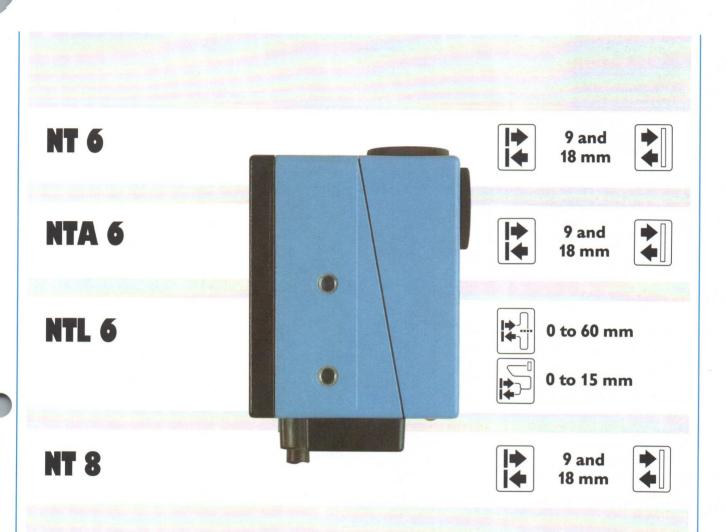
#### **Analog Output**

The analog output can be used for contrast evaluation. The output voltage corresponds to the current gray-scale value.



162 NT 6 scanners (customized versions) on a drinks-filling machine controlling container position prior to filling and cutting

# NT 6, NTA 6, NTL 6, NT 8 Contrast Scanners



Contrast scanners in diecast metal housing. Interchangeable lenses for scanning distances from 9 to 18 mm. Supply voltage range 10 to 30 V (lamp voltage on NT 8: 4.5 V). Status indicator.

High switching frequency of up to 10,000/s. Adjustable switching threshold. PNP, NPN and B outputs, short circuit protected. Modulatedlight operation (not on NT 8), thereby largely insensitive to ambient light. Enclosure rating IP 67 (dusttight, watertight).

NTA 6 with automatic sensitivity adjustment. NTL 6 for fiber-optic cable connection (200 to 1500 mm). NT 8 to detect very small contrasts. Various light spot positions. White, red, green and infrared light sources.



# **Scanning Distance**

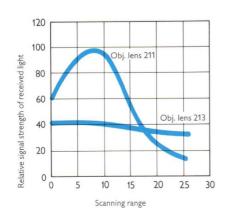


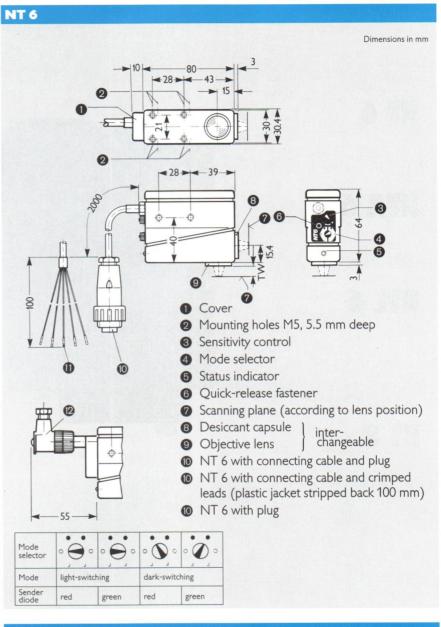
9 and 18 mm

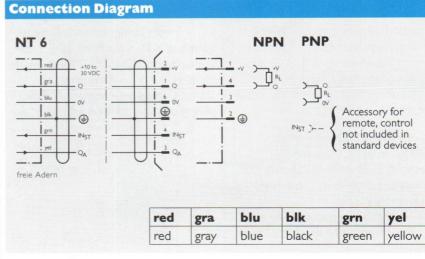


#### **Features**

- LED light source with two switchselectable spectral ranges
- Changeable lens position
- Supply voltage reverse-polarity protected
- Insensitive to ambient light
- Light- or dark-switching, switch-selectable
- Status indicator
- Switching frequency up to 10,000/s
- Analog output
- Short response time
- Remote control and timing elements possible
- Semi-automatic switchingthreshold adjustment
- Die-cast metal housing







# **Contrast Control Scanner**

NT									
Part No.	see Selec	tion Table							
Scanning distance	scanning	distance	scanning dis	t. tolerance	light spot dim	ensions			
					green	red			
With lens No. 211 (Part No. 1004936)	9 mm		±2 mm		$1.5 \times 5 \text{ mm}^2$	1.5 x 4 mm			
With lens No. 213 (Part No. 2009 266)	18 mm		±2 mm		$2 \times 8 \text{ mm}^2$	$2 \times 7  \text{mm}^2$			
Supply voltage V <sub>s</sub>	10 to 30	VDC <sup>1</sup> )							
Current consumption (no load)	≦80 mA								
Ripple <sup>2</sup> )	≦5 V <sub>pp</sub>								
Light source		rage service life	e 100,000 h <sup>3</sup> )						
Light wavelength	650 nm (	red), 560 nm	(green), switch	-selectable					
Modulation frequency	approx. 2								
Light spot orientation			e to short side	of device					
Light receiver				or device					
Wavelength	450 to 75	0 nm (visible	light)						
Switching output		` `	switch-selectal	)le					
Туре		NPN and PNP		,ie					
Output voltage HIGH	$V_S - \leq 2$		$V_S - \leq 2V$						
Output voltage LOW	¥\$ <b>=</b> 2 <b>V</b>								
Output current max.	200 mA								
Pull-up/pull-down resistance	22 kΩ		200 mA 22 kΩ						
Response time; switching frequency <sup>4</sup> )		max. 50 μs; max. 10,000/s							
Analog output (Ri = 10 k $\Omega$ )					a >				
Enclosure rating		approx. 0.15 to approx. 6 V (no reflection to total reflection)  IP 67							
		0 to +50°C							
Ambient operating temperature									
Storage temperature <sup>5</sup> )	-25 to +75 °C								
Connecting cable		$2 \text{m}$ , $4 \times 0.34 \text{ mm}^2$ , shielded, PVC, O.D. $6 \text{ mm}$ ( $5 \times 0.34 \text{ mm}^2$ for remote control)							
Weight	approx. 5								
1) Limit values; reverse-polarity protected 2) Must be within V₅ tolerances 3) At room temperature = +25 °C		dark time ratio of 1:1; ort cable below 0°C							
			ve lens No. 211)		Io				
	Part No. 1005 821	Model NT 6-03 012	Light spot orien.		Options	Cable plug			
				В		•			
	1005 822	NT 6-03 022	vertical T	В					
	1005 823	NT 6-13 012		В		•			
	1005 824	NT 6-13 022	horizontal T	В					
	1006474	NT 6-04012		PNP		•			
	1006475	NT 6-04022		PNP					
	1005829 NT 6-08012		PNP	15 ms delay	•				
	1005 830	NT 6-08 022			15 ms delay				
	1005 825	NT 6-07012	vertical	PNP	50 ms delay	•			
	1005 826	NT 6-07 022		PNP	50 ms delay				
	1 005 051	NT 6-00215		NPN	remote control	cable, 5 m long			
			olug, without cable	e, suitable for e	explosion protection	on zone 2:			
	1006367	NT 6-03 018		В		with 4-pin plug			
	1 007 478	NT 6-04018	vertical 🖁	PNP		The Pilipius			

LM 15 Infrared light Scanning distance (mm)

Scanning distance (mm)

sensitivity (%)

LM 12 Infrared light



# **Scanning Distance**

0 to 15 mm



0 to 60 mm



data sheet should not be

exceeded. The curves

illustrate the optimal scanning distances.

#### **Features**

- 200, 500, 1000, 1300 and 1500 mm fiber-optic cables available
- Fiber-optic cables for throughbeam and proximity applications
- 40 mm minimum bending radius
- Light source with two switchselectable spectral ranges
- Short response time
- Supply voltage reverse-polarity protected
- Semi-automatic switching threshold adjustment
- Insensitive to ambient light
- Light- or dark-switching, switchselectable
- Status indicator
- Switching frequency up to 10,000/s
- Analog output
- Die-cast metal housing

Mode selector	٥		0	
Mode	light-swite	ching	dark-sw	vitching
Sender diode	red	IR	red	IR

# NTL 6 Dimensions in mm -28 **←** 28 **★ ←** 39 **→** 8 1 Cover 2 Mounting holes M5, 5.5 mm deep 9 3 Sensitivity control 1 4 Mode selector 6 Status indicator 6 Quick-release fastener 7 Fiber-optic cable connector 8 Desiccant capsule Onnecting cable with plug Connecting cable without plug; cable with crimped leads (plastic jacket stripped back 100 mm) Based on White standard (DIN 5033) Scanning ranges, limits 50 As reliable functioning makes a safety allowance 30 necessary, the scanning SD distances indicated in the

Scanning distance (mm)

50 -

# **NTL 6 Contrast Scanner** with Fiber-optic Cables

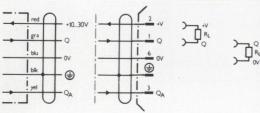
NTL 6						
Part No.	see Selection Table					
Scanning distance <sup>1</sup> ) (1-tip config.)	(red)	(infrared)				
Fiber-optic cables LM 15, 16, 17, 18, 21	0.5 to 5 mm	0 to 15 mm				
Scanning distance (2-tip configuration)						
Fiber-optic cables LM 12, 18, 22	0 to 20 mm <sup>2)</sup>	0 to 60 mm				
Supply voltage V <sub>S</sub>	10 to 30 VDC <sup>3)</sup>					
Current consumption (no load)	≦80 mA					
Ripple <sup>3)</sup>	≦5 V <sub>DD</sub>					
Light source	LED, average service life 100,0	00 h <sup>4)</sup>				
Light wavelength	650 nm (red), 920 nm (infrared	), switch-selectable/fiber-optic cable plug-selectabl				
Modulation frequency	approx. 200 kHz	, , , ,				
Light spot orientation	depending on fiber-optic cable	e used				
Light receiver						
Wavelength	450 to 920 nm					
Switching output	light- or dark-switching, switch-selectable					
Type	$B (= Q_B = NPN \text{ and } PNP)$					
Output voltage HIGH	V <sub>s</sub> -≦2 V					
Output voltage LOW	≦2 V					
Output current max. <sup>5)</sup>	200 mA					
Pull-up/pull-down resistance	22 kΩ					
Response time; switching frequency <sup>6)</sup>	max. 50 μs; max. 10,000/s					
Analog output $(R_i = 10 \text{ k}\Omega)$	approx. 0.3 to approx. 6 V (no	reflection to total reflection)				
Enclosure rating	IP 67					
Ambient operating temperature	0 to +50°C					
Storage temperature <sup>7)</sup>	-25 to +75°C					
Connecting cable	2 m, 4×0.34 mm <sup>2</sup> , shielded, PVC, O.D. 6 mm					
Weight	approx. 540 g					
1) Based on white standard, to DIN 5033 2) Limit values; reverse-polarity protected 3) Must be within V- tolerances	4) At room temperature = +25 °C 5) Short circuit proof	6) With light/dark time ratio of 1:1; no time delay 7) Do not distort cable below 0°C				

1	) Based on white standard, to DIN 5033
2	Limit values; reverse-polarity protected
3	Must be within V <sub>s</sub> tolerances

Selectio	n lable			
Part No.	Model	Switching output	Options	Cable plug
1008615	NTL 6-B11	В		•
1008616	NTL 6-B12	В	_	-
1009593	NTL 6-E11	PNP	15 ms minimum time	•
1009594	NTL 6-E12	PNP	15 ms minimum time	_

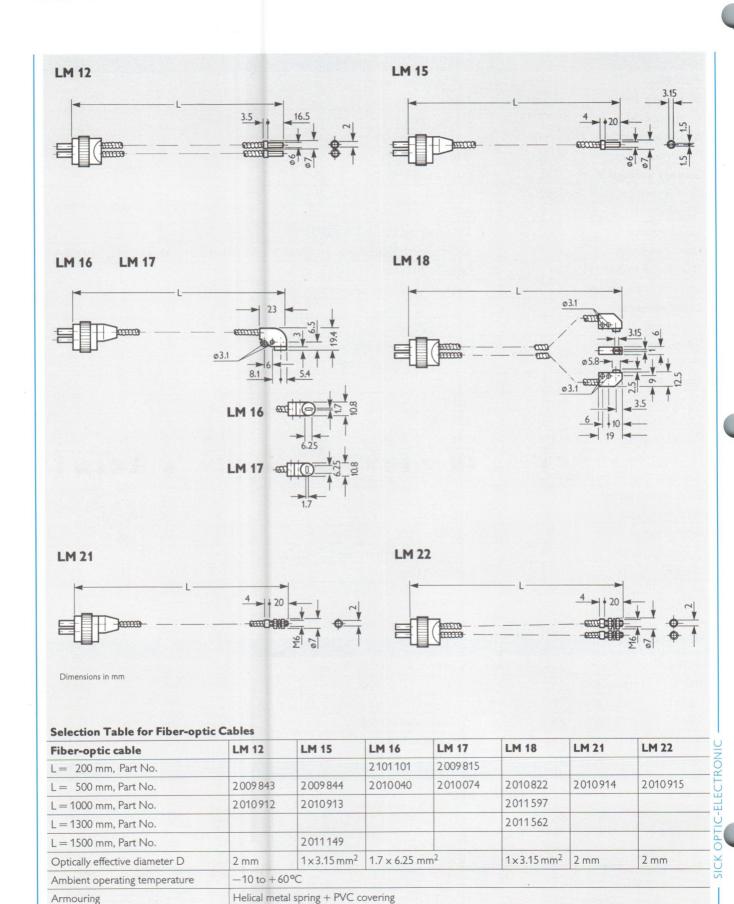
# **Connection Diagram**

NTL 6	NPN	PNP



red	gra	blu	blk	yel
red	gray	blue	black	yellow
rot	grau	blau	schwarz	gelb

# Fiber-optic Cables for NTL 6



Minimum bending radius

40 mm



NT 6 scanners using printed marks to control proper fitting of seal and label on a champagne corking machine



# **Scanning Distance**

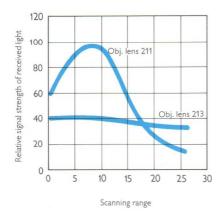


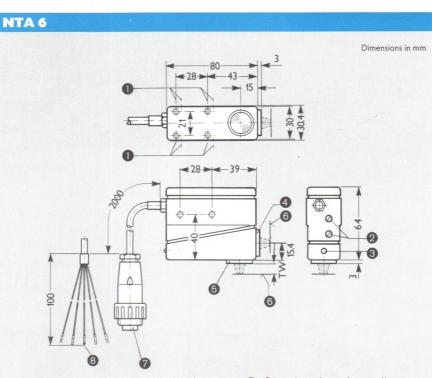
9 and 18 mm



## **Features**

- Automatic adjustment of switching threshold
- Changeable lens position
- Plug-in light source; two spectral ranges available; two light spot orientations (horizontal or vertical)
- Status indicator
- Supply voltage reverse-polarity protected
- Insensitive to ambient light
- Remote selection of light- or dark-switching mode
- Switching frequency up to 10,000/s
- Short response time
- Remote control of Enable/Inhibit blanking function and setting of background reference
- Die-cast metal housing

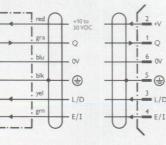




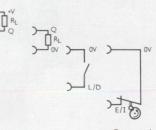
- 1 Mounting holes M5, 5.5 mm deep
- Screw cap
- Status indicator
- 4 Desiccant capsule
- 6 Objective lens
- interchangeable
- Scanning plane (according to lens position at scanning distance)
- NTA 6 with connecting cable and plug
- NTA 6 with connecting cable but with no plug; cable with crimped leads (plastic jacket stripped back 100 mm)

## **Connection Diagram**





#### NPN PNP



L/D = light/dark control wire

Control of Enable/ Inhibit blanking function and setting of background reference

red	gra	blu	blk	yel	grn
red	gray	blue	black	yellow	green

# NTA 6 Contrast Scanner with Automatic Sensitivity Adjustment

NTA 6								
Part No.	see Select	ion Table						
Scanning distance	scanning o	distance	scanning dis	t. tolerance	light	spot dim	nensions	3
					gree		red	
With lens No. 211 (Part No. 1004936)	9 mm		±2 mm		-	< 5 mm <sup>2</sup>	2×4	mm <sup>2</sup>
With lens No. 213 (Part No. 2009 266)	18 mm		±2 mm				2×7	mm <sup>2</sup>
Supply voltage V <sub>s</sub>	10 to 30 V	/DC <sup>1</sup> )						
Current consumption (no load)	≦90 mA	,						
Ripple <sup>2</sup> )	≤5 V <sub>pp</sub>							
Light source	LED, average service life 100,000 h <sup>3</sup> )							
Light wavelength	650 nm (r	red) / 560 nm (	green); plug-	·in				
Modulation frequency	approx. 2		9 71 0					
Light spot orientation		e or transverse t	o short side	of device				
Light receiver								
Wavelength	450 to 75	0 nm (visible lig	ht)					
Switching output	remote se	election of light-	or dark-swite	ching mode	(L/D co	ontrol wi	re)	
Туре	B (NPN a							
Output voltage HIGH	$V_S - \leq 2 V$							
Output voltage LOW	≤2 V							
Output current max. <sup>4)</sup>	200 mA							
Pull-up/pull-down resistance	22 kΩ							
L/D control input: light-switching	7.5 V < V	L/D < 30 V (not	connected)					
L/D control input: dark-switching	<3 V							
Control input: pull-up resistance	6.8 kΩ							
Enable/Inhibit								
Inhibit (blanking)	V <sub>E/I</sub> ≦1 V							
Enable	$5 \vee \leq \vee_{E/I}$	≦30 V (not co	nnected)					
E/I control input: pull-up resistance	6.8 kΩ							
Response time; switching frequency <sup>5</sup> )	max. 50 μ	s; max. 10,000/s	3					
Minimum switching frequency (required)	0.01/s							
Enclosure rating	IP 67							
Ambient operating temperature	$0 \text{ to } +50^{\circ}$	°C						
Storage temperature <sup>6</sup> )	-25  to  +	75°C						
Connecting cable	$2  \text{m}, 5 \times 0$	0.34 mm <sup>2</sup> , shield	ed, PVC, O.[	D. 6 mm				
Weight	approx. 5	40 g						
1) Limit values; reverse-polarity protected 2) Must be within $V_s$ tolerances	3) At room ten 4) Short circuit	mperature = +25°C proof		5) With lig 6) Do not	ght/dark tim distort cabl	e ratio of 1:1; e below 0°C	; no time del	lay
	Selection Part No. 1007 861 1006 369 1007 862 1007 863 1007 864 1007 865	Table   Model   NTA 6-N111   NTA 6-N311   NTA 6-N112   NTA 6-N312   NTA 6-P111   NTA 6-P311   NTA 6-P112	Switching output NPN NPN NPN NPN PNP PNP	Light spot orientation  vertical	Sender red gree		ective No. 211	Cab

PNP

NPN

NPN PNP

PNP

NTA 6-P312 NTA 6-N212

NTA 6-N412

NTA 6-P212 NTA 6-P412

1007867

1007869

1007871

•



# **Scanning Distance**

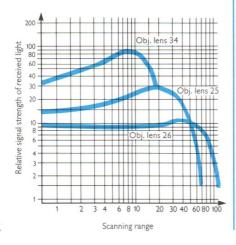


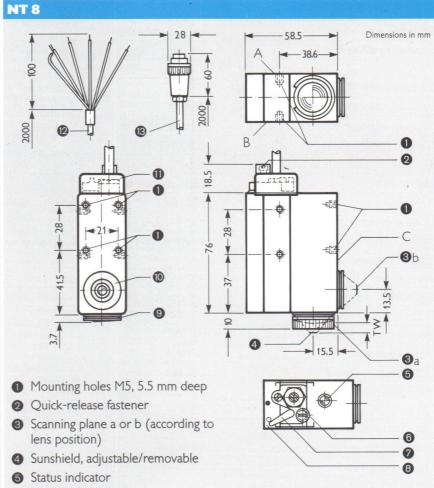
9 and 18 mm



#### **Features**

- Detects very slight contrasts
- White light source, filterable
- Changeable lens position
- Switch-selectable light- or darkswitching
- Supply voltage reverse-polarity protected
- Status indicator
- Adjustable switching threshold
- Switching frequency up to 10,000/s
- Interchangeable objective lenses
- Switching output short circuit protected
- No false triggering on power-up
- Die-cast metal housing



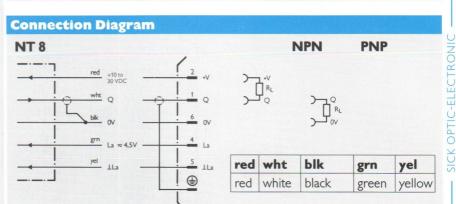


- 6 Sensitivity control
- 2 Light / dark selector
- 8 Housing cover (remove when replacing lamp)
- Objective lens (shown without sunshield)

Desiccant cartridge with inspection window interchangeable

11 Cover

- Connecting cable with crimped leads
- Connecting cable with plug
- A B C Mounting surfaces



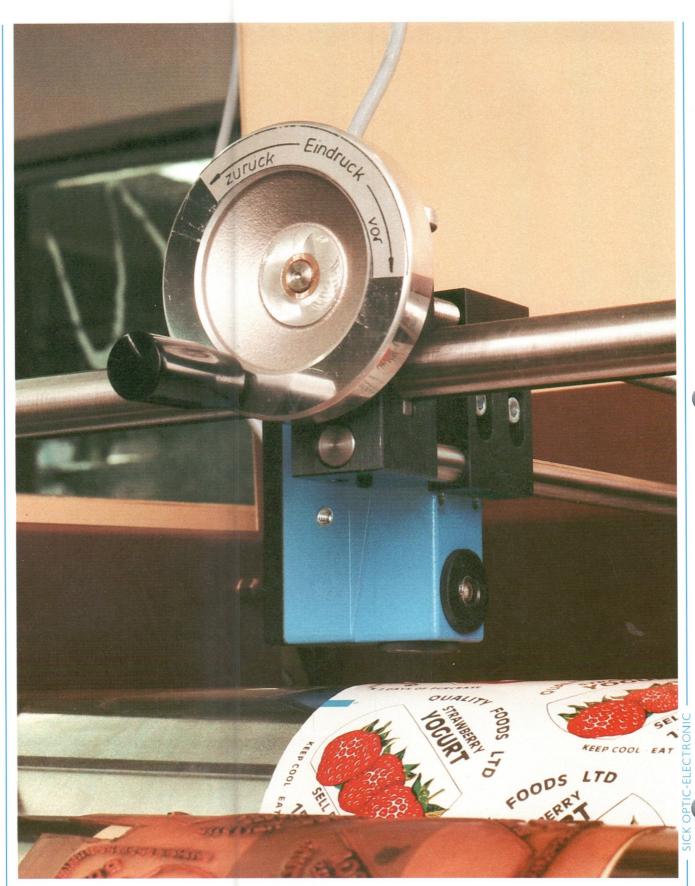
# NT 8 Contrast Scanner

Part No.	see Selection Table			
Scanning distance	scanning distance	scanning dist. tolerance	light spot dimensions	
With lens No. 24 (Part No. 1001324)	9 mm	±2 mm	1.5 × 3.5 mm <sup>2</sup>	
With lens No. 25 (Part No. 1001325)	18 mm	±2 mm	2 × 5 mm <sup>2</sup>	
With lens No. 26 (Part No. 1001326)	50 mm		$2.5 \times 6 \text{ mm}^2$	
With lens No. 27 (Part No. 1001327)	120 mm		4 × 10 mm <sup>2</sup>	
Supply voltage V <sub>S</sub>	10 to 30 VDC <sup>1</sup> )			
Current consumption (no load)	≦50 mA			
Ripple <sup>2</sup> )	≦2 V <sub>pp</sub>			
Lamp supply voltage <sup>3</sup> )	4.5 VAC/DC ± 10%			
Lamp current consumption	approx. 840 mA			
Light source	incandescent lamp, average service life at rated voltage: 10,000 h			
Type of light	white, visible			
Light spot orientation	lengthwise or transverse to short side of device			
Light receiver				
Wavelength	450 to 750 nm (visibl	e light)		
With OG 530 color filter	530 to 750 nm (Part No. 1001 598)			
With OG 570 color filter	570 to 750 nm (Part No. 1001 599)			
With RG 610 color filter	610 to 750 nm (Part I	No. 1001 600)		
Switching output	light- or dark-switchin	g, switch-selectable		
Туре	PNP	NPN		
Output voltage HIGH	V <sub>s</sub> -≦2 V	Vs		
Output voltage LOW	0 V	≦2 V		
Output current max.4)	200 mA			
Response time; switching frequency <sup>5</sup> )	max. 50 µs; max. 10,0	00/s		
Enclosure rating	IP 67			
Ambient operating temperature	0 to +55 °C			
Storage temperature <sup>6</sup> )	-25 to +85 °C			
Connecting cable	$2 \mathrm{m}, 2 \times 0.5 \mathrm{mm}^2, 2 \times 0.14 \mathrm{mm}^2, 1 \times 0.14 \mathrm{mm}^2$ , shielded, PVC, O.D. 6 mm			
Weight (incl. connecting cable)	approx. 300 g			
1) Limit values; reverse-polarity protected 2) Must be within V <sub>S</sub> tolerances 3) Voltes and the polarity protected	4) Short-circuit proof 5) With light/dark time ratio of	1.1; no time delay		

3) Voltage drop on cable should be taken into account

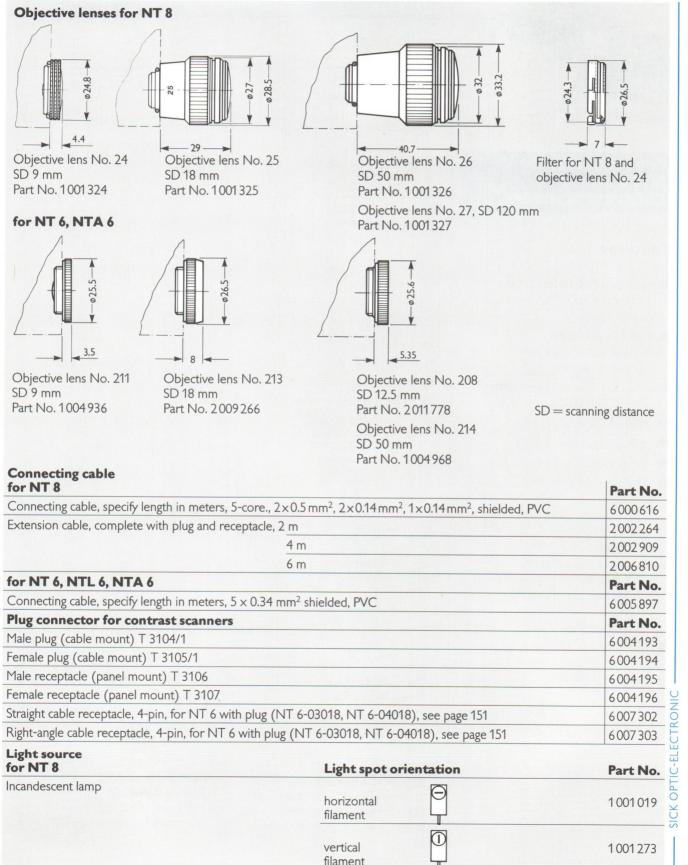
5) With light/dark time ratio of 1.1; no time delay 6) Do not distort cable below 0°C

Selection	Table			0 0		
Part No.	Model	Light spot orientation	Switching output	Objective lens	Option	Cable plug
1005 981	NT 8-01 412	vertical	NPN .	No. 24		•
1005 985	NT 8-02412		NPN	No. 24		
1005 983	NT 8-01512		NPN	No. 25		0
1005 987	NT 8-02512		NPN	No. 25		
1006007	NT 8-16412		NPN	No. 24	increased sensitivity	
1006011	NT 8-17412		NPN	No. 24	increased sensitivity	0
1006039	NT 8-21412		PNP	No. 24		
1006043	NT 8-22 412		PNP	No 24		



174 NT 6 Contrast control scanner using a blue registration mark to control the correct location of printing

# Accessories Contrast Scanners

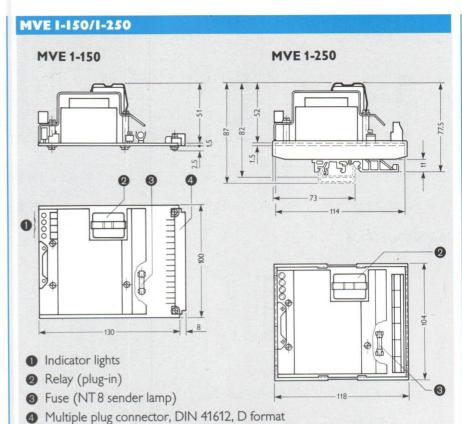


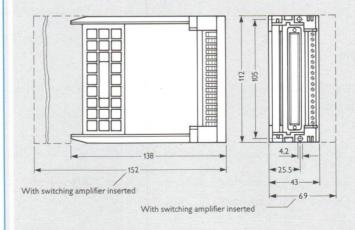


# For NT 6, NTA 6, NTL 6 and NT 8 Contrast Scanners

#### **Features**

- Eurocard (shortened) 100 x 130 mm<sup>2</sup> with 32-pin strip (DIN), a and c layout
- Plug-in card holder for wall mount capability (front connection)
- Choice of line voltages (factory setting: 220 VAC)
- Lamp voltage 4.5 V, 1 A
- Relay output
- Status indication by four LEDs
- Choice of six different time functions:
  - ON-delay
  - OFF-delay
  - ON- and OFF-delay
  - positive-edge triggered ONE SHOT
  - negative-edge triggered ONE SHOT
  - no time delay
- Continuously adjustable time





# Input Functions Reset Input RS

Memory reset with HIGH signal at RS. RS input has priority over all other inputs.

#### External Trigger Input FS

Memory set with LOW signal at FS. FS only effective for machine- controlled reset.

#### Scanner Input NT

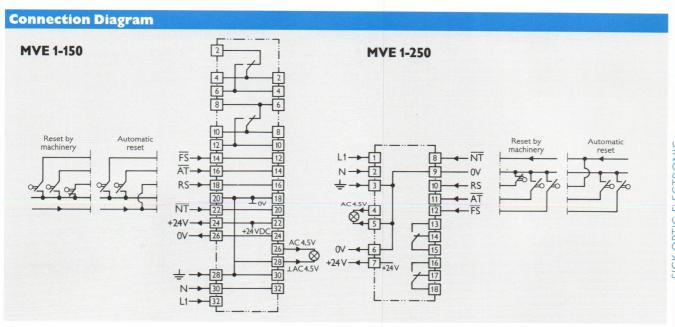
Memory set with LOW signal at NT. When not resetting with RS command (machine contact), NT can be connected to RS.

# Blanking Input AT (Enable/Inhibit)

Setting commands at  $\overline{\text{NT}}$  and  $\overline{\text{FS}}$  ignored with LOW signal at  $\overline{\text{AT}}$ .

# MVE 1-150/MVE 1-250 Switching Amplifier

MVE	I -150	-250
Part No.	1008964	1010494
Card holder with receptacle, Part No.	6000353	
Supply voltage	100, 110, 120, 200, 220, 240	VAC (+10%, -15%)
Power consumption	approx. 10 VA	
Inputs	NT, FS, AT, RS	
Input voltage HIGH	≥10 to ≤24 V	
Input voltage LOW	≦2 V	
Input current LOW	1 mA	
Outputs		
Power supply for NT electronics	24 VDC (+5%, -15%)	
Output current max.	80 mA	
Output voltage for NT 8 sender lamp	4.5 VAC	
Output current max.	1 A	
Relay output	DPDT	
Switching voltage max.	250 VAC	
Switching current max.	10 A	
Switching power max.	650 VA (AC), 240 W (24 VDC), 48 W (48 VDC)	
Time delay		
ON-delay	0.1 to 2.5 s	
OFF-delay	0.1 to 2.5 s	
Positive-edge triggered	0.1 to 2.5 s	
Negative-edge triggered	0.1 to 2.5 s	
Enclosure rating	IP 00	
Ambient operating temperature	-20 to +65°C	
Storage temperature	−20 to +75°C	
Weight	approx. 630 g	
Substitute relay	Part No. 6000 978	

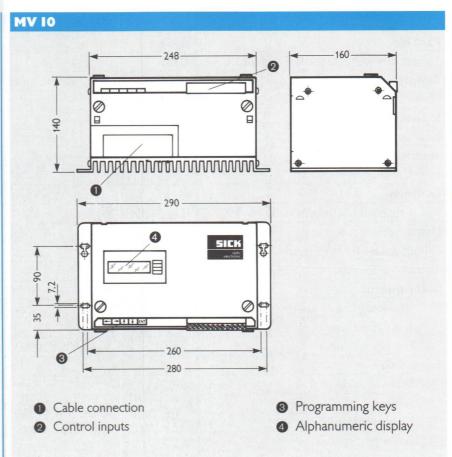


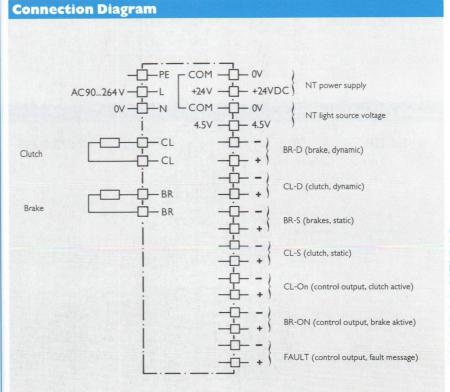


# For NT 6, NTA 6, NTL 6, Contrast Scanner

#### **Features**

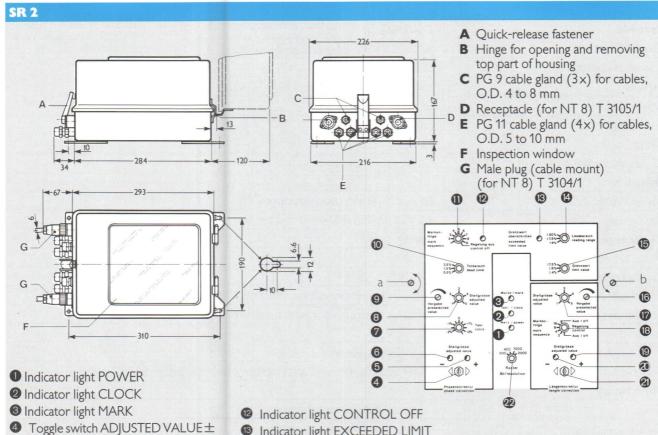
- High-speed switching of electric brakes and clutches
- Freely programmable parameters:
  - solenoid current
  - time delay for brake
  - quick-energizing time
  - quick-energizing current
- Universal supply voltage
- Universal coil voltage
- Current-regulated overexcitation
- Four floating optocoupler inputs
- Three floating optocoupler outputs
- Floating current supply for the contrast scanner





# MV 10 Switching Amplifier

MV	710			
Part No.	6 009 427			
Supply voltage	90 to 264 VAC (absolute limit values)			
Power consumption	288 VA (maximum)			
Inputs	floating optocoupler inputs 10 to 30 VDC			
Brake, static	BR-S			
Brake, dynamic	BR-D			
Clutch, static	CL-S			
Clutch, dynamic	CL-D			
Outputs				
Power supply: NT	24 VDC/100 mA short-circuit proof			
Power supply: light source	4.5 VDC/800 mA short-circuit proof			
Control outputs	floating optocoupler outputs 10 to 30 VDC/100 mA			
Brake, aktive	BR-ON			
Clutch, active	CL-ON			
Fault message	FAULT (with undervoltage, short-circuit, earth contact)			
Power circuit outputs	Exclusive OR-operation with overexcitation			
Solenoid voltage	3 to 48 V			
Solenoid current	0.9 to 6 A adjustable			
Overexcitation	current-regulated, value and duration of current separately adjustable			
Time delay				
Brake	on delay 0 to 250 ms adjustable			
Clutch	on delay 0 to 250 ms adjustable			
Ambient operating temperature	-20 to +50 °C			
Storage temperature	−20 to +70 °C			
Enclosure rating	IP 20			



- Indicator light EXCEEDED LIMIT VALUE
- Selector switch READING RANGE
- Selector switch LIMIT VALUE
- 6 Control PRESELECTED VALUE (length correction)
- Control ADJUSTED VALUE (length correction)
- Selector switch MARK SEQUENCE for length correction
- Indicator light ADJUSTED VALUE + for length correction
- Indicator light ADJUSTED VALUE for length correction
- ② Toggle switch ADJUSTED VALUE± for length correction
- Bit setting (adaptation to timing bars of the shaft timing encoder)
- a,b Quick-release fasteners



for phase correction

Selector switch CLOCK

8 Control ADJUSTED VALUE

Selector swich DEAD ZONE

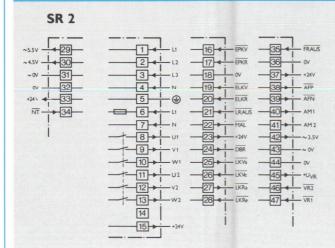
**9** Control PRESELECTED VALUE

Selector switch MARK SEQUENCE

for manual phase correction

Indicator light ADJUSTED VALUE +

6 Indicator light ADJUSTED VALUE -



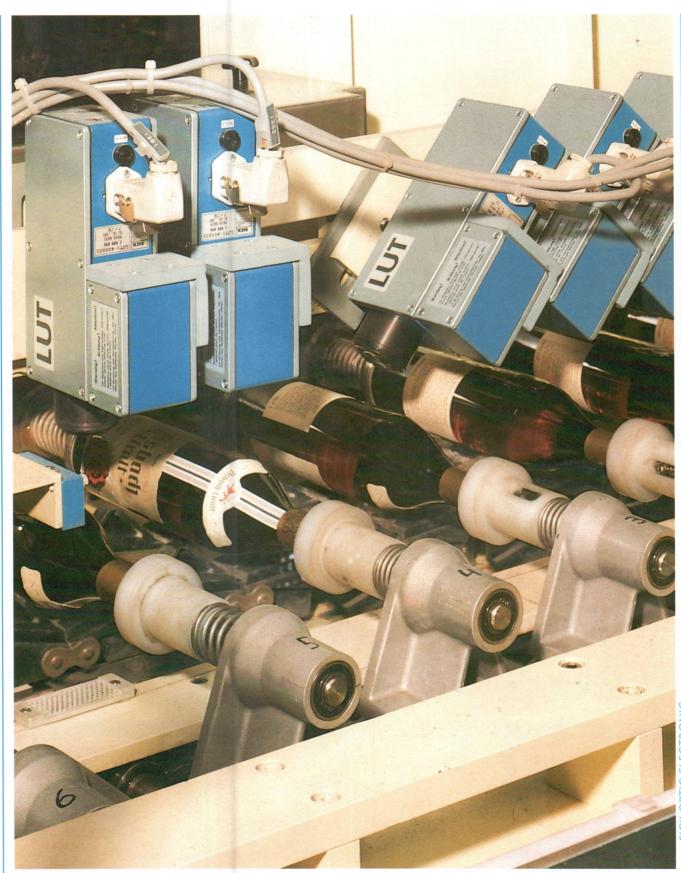
# **Two-way Registration Control**

SR 2	
Part No.	see Selection Table
Supply voltage	220 VAC (+10%, -15%)
Power consumption	approx. 55 VA
Inputs	NT, proximity switches
Input voltage HIGH	+11 to +50 V
Input voltage LOW	≤+4V
Input current	15 mA
Signal duration (mark and clock), min.	1.5 ms
Signal duration (other input signals), min.	30 ms
Signal duration (shaft timing encoder), min.	0.025 ms (shaft timing encoder R 200/400/600/1000/2000)
Outputs	
Power supply for NT electronics	24 VDC
Output current max.	100 mA
Output voltage for NT 8 sender lamp	4.5 VAC, 5.5 VAC
Output current max.	2.5 A
Relay output	
Switching voltage max.	380 VAC
Switching current	4 A
Analog output for pointer-type instrument	≦±20 mA
Control	
Clock (fine adjustment in 0.5% steps)	-2  to  +2.5%
Mark sequence	1 to 9 (phase-correction control range), 2 to 6 (length-correction control range)
Reading range	$\pm 4\%$ , $\pm 7.5\%$ , $\pm 50\%$ <sup>1</sup> ) (phase-correction control range)
Dead zone	0.5%, 1.5%, 2.5% (control range)
Limit value	±4%, ±6%, ±7.5% (control range)
Adjusted value	1:5 (t/setting max. 0.5 s), phase- and length-correction control range
Preselected value	±30 ms (phase- and length-correction control range)
Number of register-pattern lengths / min.	
With timing disk	min. 30 to max. 8000
With shaft timing encoder	>0 to max. ≤6000
Enclosure rating	IP 64
Ambient operating temperature	0 to +55 °C
Storage temperature	-40 to +85 °C
Weight	9.5 kg
This value does not change with a different resolution	

1) This value does	not change w	vith a different	resolution
--------------------	--------------	------------------	------------

<b>Selection T</b>	able		
Part No.	Model	Design	
1004486	SR 2-1433	phase correction with phase supplement board and housing	
1004487	SR 2-1443	phase correction with phase supplement board without housing	
1004612	SR 2-1453	phase correction with length correction and housing	
1004613	SR 2-1463	phase correction with length correction without housing	

Two-way registration control controls shifts in phase and length when cutting a moving web, which are caused by slip between cutting station and printed pattern lengths.



182 LUT 1-4 luminescence scanners controlling the alignment of bottles by the labels

# Luminescence Scanners

### Luminescence Scanners

Modern production and processing techniques call for the optical detection of markings. Registration control scanners are able to detect printed marks on packaging material, thereby ensuring correct cutting and folding. In logistics, receptacles are marked according to storage destinations; in quality control, defects are marked; but it may also be necessary to monitor adhesive application to a material, for example.

Provided the marking is clearly distinguishable from the background, reliable information can be obtained using conventional photoelectric sensors.

In practice, however, this is not always the case, either because markings on a high-contrast texture, such as wood, cannot be read, or because there is no contrast at all, e.g. adhesive applied to paper, grease to metal, or oil on water. It may even be the basic intention that the marking should not be detected by the human eye.

In these and many similar instances, luminescence scanners can help to solve the problem. As the name suggests, they make use of the physical effect of photoluminescence: light of a short wavelength is converted to light of a longer wavelength.

The luminescence scanner emits ultraviolet radiation with a wavelength of approx. 365 nm. This activates a fluorescent substance which emits in the (predominantly) visually detectable range, i.e. in a spectral range between blue (450 nm) and dark red (780 nm).

This luminescent radiation is picked up by the luminescence scanner's light receiver. The optical signal (electronically prepared) is available for use as a switching signal. In parallel with the switching output, an analog signal offers the possibility of measuring the efficiency of the conversion.

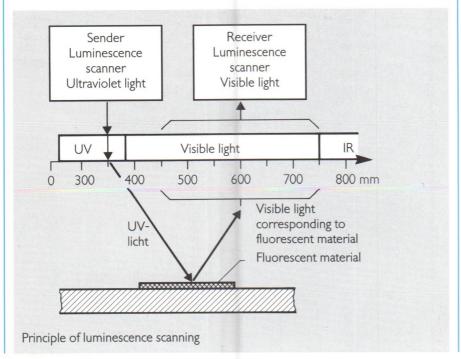
The luminescence scanner works with modulated light, the receiver

responding only to light of the same modulation frequency.

A variety of fluorescent marking agents are commercially available, some of which are ready for use. They include:

- Daylight paints
- Chalks and crayons
- Optical brighteners (for paper, textiles, soaps and plastics)
- Highlighter pens
- Fluorescent inks
- Varnishes / lacquers
- Oils / greases

Fluorescent pigments suitable for marking adhesives, for example, are also available.



### LUT 1-4, LUT 1-5 Luminescence Scanners

**LUT 1-4** 



8 to 300 mm



LUT 1-5





8 to 125 mm



Luminescence scanners in die-cast housing. Interchangeable objective-lenses for different scanning distances.

Insensitive to surface reflections. Spectral sensitivity restricted by optical filter attachments.

Long-life UV light source.

Status indicator (in addition to readiness and digital indication of degree of luminescence on LUT 1-4).

Supply voltage range 18 to 30 V. Enclosure rating IP 63 (LUT 1-4) and IP 64 (LUT 1-5).

Also available as photoelectric fiberoptic switches.



Rear view of LUT 1-4 luminescence scanner, showing sensitivity control, digital indication of degree of luminescence, status indicator and readiness indicator.





Inside the LUT 1-5

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#### **Scanning Distance**

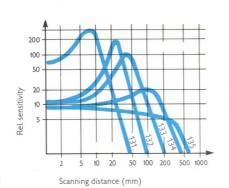


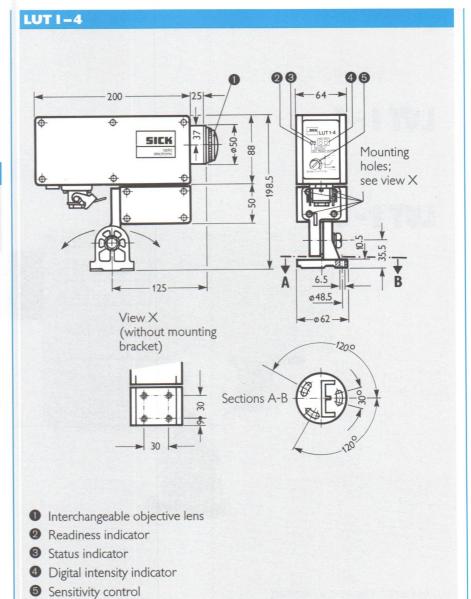
8 to 300 mm

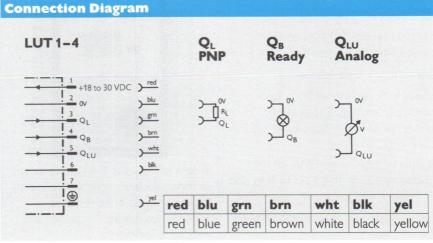


#### **Features**

- UV light source with highpressure mercury vapor lamp
- Digital intensity reading of received light
- Status indicator
- Choice of scanning ranges through interchangeable objective lenses
- Insensitive to surface reflections
- Spectral sensitivity restricted by optical filter attachments
- Adjustable sensitivity
- Short response time
- Analog monitoring output
- Readiness indicator
- Facility for connection of fiberoptic cable
- Supply connections reversepolarity protected
- Metal housing



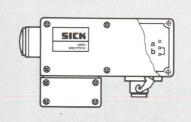




## LUT 1-4 Luminescence Scanner

LUT I – 4	00	10	20	30	40	50	
Part No.	1007 626	1005 935	1005 936	1005 937	1005 938	1005 939	
Objective lens	f. fibopt. cable	No. 131	No. 132	No. 133	No. 134	No. 135	
Objective lens, Part No.		1001 681	1001 682	1001 683	1001 684	1001 685	
Scanning distance	w/o/w/lens144						
Focal plane	8/15 mm	8 mm	20 mm	50 mm	125 mm	300 mm	
Scanning range (see diagram)		5to12mm	12 to 32 mm	32 to 80 mm	80to200mm	200 to 500 mm	
Light spot diameter	10/6 mm <sup>1</sup> )	3 mm	4 mm	8 mm	15 mm	40 mm	
Light spot with diaphr. (fiber-optic cable) <sup>2)</sup>	3mm×6mm <sup>2</sup> )						
Supply voltage V <sub>s</sub> <sup>3</sup> )	18 to 30 VDC						
Ripple max. <sup>4</sup> )	2 V <sub>pp</sub>						
Current consumption (no load, at 24 VDC)	700 mA						
Light source	high-pressure i	mercury vap	or lamp				
Wavelength	365 nm						
Modulation frequency	33 kHz						
Average service life	4000 h						
Switch-on time delay	approx. 2 min.	(restart lock	<)				
Switching outputs Q <sub>L</sub> and Q <sub>B</sub>	PNP, light- or o	lark-switchir	ng; signal out	out O <sub>i</sub> : opera	tional readine	ess Op	
Output voltage	HIGH: V <sub>s</sub> -<						
Output current <sup>5</sup> )	200 mA						
Pull-down resistance	10 kΩ						
Switching frequency, scanning ratio 1:1	max. 5000/s				darbonner 48		
At maximum sensitivity	2.5 ms						
Response time	0.1 ms						
At maximum sensitivity	2.5 ms						
Analog output $Q_{LU}$ ( $R_i = 1 k\Omega$ )	0 to 1.5 VDC						
Ambient operating temperature	0 to +45°C						
Storage temperature <sup>6</sup> )	−25 to +85°C						
Enclosure rating	IP 63						
Weight (incl. mounting bracket)	2.5 kg						
Without diaphragm     Diaphragm included	3) Limit values; reverse 4) Must be within V <sub>s</sub> to	e-polarity protecte lerances	d	5) Short circuit 6) Do not disto	proof rt cable below 0°C		

Internal jumper	o a o b o State of delivery			o a o State of	b o delivery	
Mode	light-switching			dark-sw	itching	
Sender lamp	off	started		off	started	
Luminescence	5.00	yes	no		yes	no
Output Q <sub>B</sub> (PNP)	LOW	HIGH		LOW	HIGH	
Ready indicator (red)	on	off/blink	ing*)	File	off/blink	ing*)
Output Q <sub>L</sub> (PNP)	LOW	HIGH	LOW	LOW	LOW	HIGH
Status indicator (green)	off	on	off	off	on	off



<sup>\*)</sup> blinking: lamp power still sufficient for operation



yellow

brown

turquoise



#### **Scanning Distance**

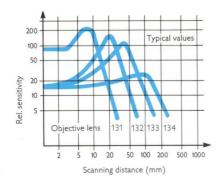


8 to 125 mm

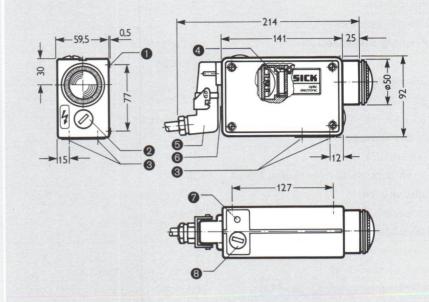


#### **Features**

- Long-life UV-A fluorescent tube by virtue of controlled lamp heating
- Status indicator
- Choice of scanning range through interchangeable objective lenses
- Insensitive to surface reflections
- Spectral sensitivity restricted by optical filter attachments
- Adjustable OFF-delay
- Adjustable sensitivity
- Switching outputs PNP and NPN, short circuit protected
- Remote selection of light- or dark-switching mode
- Analog monitoring output (power source)
- Supply connections reversepolarity protected
- Metal housing

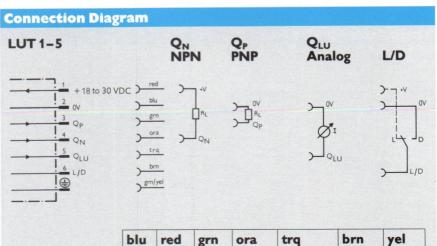


#### LUT I -5



- 4 threaded mounting holes M6,13 mm deep
- PG 13.5 (UV lamp underneath)
- **3** 4 threaded mounting holes M5, 7.5 mm deep
- 4 Filter attachment Optical filters
- **6** Cable receptacle (accessories), Part No. 2007 901
- 6 Cap srew M18 x 1 (interchangeable with desiccant cartridge)

- Status indicator (LED, red)
- PG 13.5 (sensitivity control and timedelaycontrol underneath)



green

orange

blue

red

### LUT 1-5 Luminescence Scanner

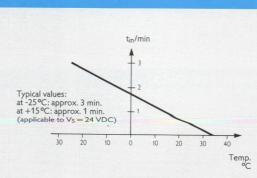
LUT I – 5	00	10	20	30	40	
Part No.	1007597	1005 931	1005 932	1005 933	1005 934	
Objective lens	f. fiber-opt. cable	No. 131	No. 132	No. 133	No. 134	
Objective lens, Part No.		1001 681	1001 682	1001 683	1001 684	
Scanning distance	w/o/w/lens144					
Focal plane	8/15 mm	8 mm	20 mm	50 mm	125 mm	
Scanning range (see diagram)		1.5 to 10 mm	14 to 28 mm	22 to 56 mm	30 to 140 mm	
Light spot diameter	10/6 mm <sup>1)</sup>	5 mm	8 mm	15 mm	35 mm	
Light spot with diaphr. (fiber-optic cable) <sup>2)</sup>	3 mm × 6 mm <sup>2)</sup>					
Supply voltage V <sub>s</sub> <sup>3)</sup>	18 to 30 VDC					
Ripple max. <sup>4)</sup>	2 V <sub>pp</sub>					
Current consumption (no load, at 24 VDC)	<800 mA					
Light source	UV-A fluorescer	nt tube				
Wavelength	365 nm					
Modulation frequency	2.5 kHz					
Average service life	8000 h					
Switch-on time delay	approx. 1 min. a	t ambient temp	erature = 15°C			
Switching outputs Q <sub>N</sub> and Q <sub>P</sub>	NPN/PNP, light	- or dark-switch	ning			
Output voltage PNP	HIGH: V <sub>s</sub> -<2					
Output voltage NPN	HIGH: V <sub>s</sub> -<1	V, LOW: <1 \	/			
Output current <sup>5)</sup>	200 mA					
Pull-up/pull-down resistance	10 Ω					
Response time; switching frequency	max. 1 ms; max.	250/s				
Time delay	adjustable from	3 ms to 100 ms				
Analog output $Q_{LU}$ ( $R_L < 800 \Omega$ )	0 to 10 mA					
Ambient operating temperature <sup>6)</sup>	-25 to +50°C					
Storage temperature <sup>6)</sup>	-25 to +85°C					
Enclosure rating	IP 64					
Weight (without mounting bracket)	1.1 kg					

Without diaphragm
 Diaphragm included

<sup>5)</sup> Short circuit proof 6) Do not distort below 0°C

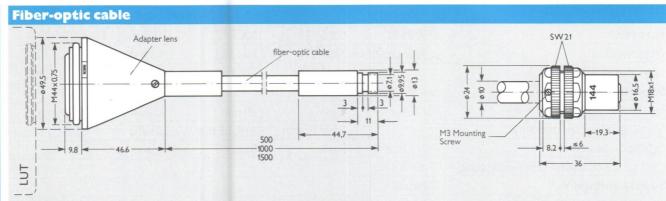
a/b	+ V	+ V			0 V		
	or open	or open					
Mode	light-swi	tching		dark-swi	tching		
Sender lamp	off	started		off	started		
Luminescence		yes	no		yes	no	
Output Q <sub>PNP</sub>	LOW	HIGH	LOW	HIGH	LOW	HIGH	
Output Q <sub>NPN</sub>	HIGH	LOW	HIGH	LOW	HIGH	LOW	
Status indicator	off	on	off	off	on	off	
		blinking*)		blinking*)			

<sup>\*)</sup> Blinking: Lamp power still sufficient for operation



SICK OPTIC-ELECTRONIC

<sup>3)</sup> Limit values; reverse-polarity protected 4) Must be within  $V_s$  tolerances



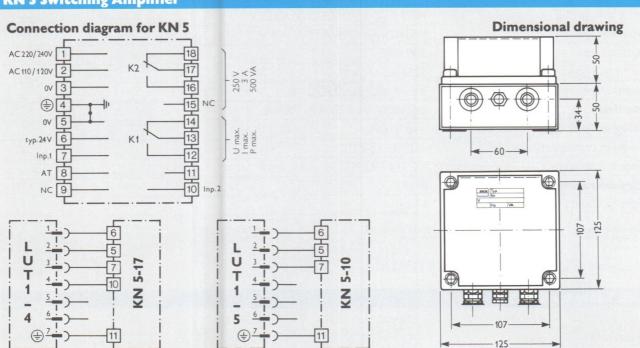
Minimum bending radius of fiber-optic cable R = 60 mm

Temperature range: -5...+35°C Not to be mechanically loaded outside ambient temperature range. Not to be distorted below 0°C. Attachment lens no.144

Fiber-optic cables including adapter lens (for LUT 1-5 and LUT 1-4)

LLUV 5- 500 1005 621 500 mm long LLUV 5-1000 1005 622 1000 mm long LLUV 5-1500 1005 623 1500 mm long

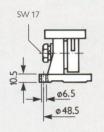
#### **KN 5 Switching Amplifier**

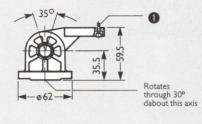


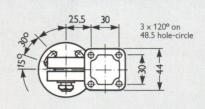
KN 5	-101	-103	-171	-173	
Part No.	1004 699	1005 480	1004 653	1005 181	
Supply voltage	110/220 V	120/240 V	110/220 V	120/240 V	
for LUT	LUT 1-5			LUT 1-4	
Input 1	Relay K2		0.1 s	Fall-delay time K2	
Input 2		Relayl K1		Relay K1	
Input AT	NC		HIGH: Scanning K2		
Electronics supply	typ	24 V/max. 0.8 A	typ 24 V/max. 0.8 A		

## Accessories Luminescence Scanners

#### **Mounting bracket for LUT 1-5**



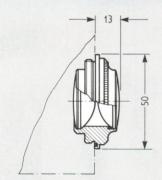




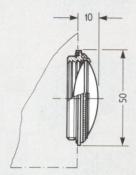
Part No. 1005 580

1 4 Allen screws M6 x 10 with DIN 137 spring washer

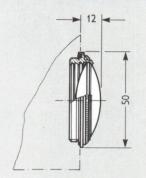
#### **Objective lenses**







Obj. lens 133 Part No. 1001 683 (Obj. lens 134 Part No. 1001 684)



Obj. lens 135 Part No. 1001 685

Connecting cable	LUT 1-4	LUT 1-5		
with receptacle, 2 m	2006 545	2008 423		
with receptacle 6 m	2006 860	2008 425		
with receptacle 10 m	2007 595	2008 427		
Connecting cable, specify in meters	6000 607	6006 501		
Slotted mask to limit lens coverage	-	4017 694		
Colour filter				
OG 570 570750 nm	4005 810	4018 534		
OG 610 610750 nm	4012 735	4018 535		
RG 630 630750 nm	4014 153	4018 536		
RG 665 665750 nm	4014 154			
Luminescent chalk				
Chalk, water-soluble	1	1004 460		
Chalk, non water-soluble		002 959		



192 WSU/WEU 26 photoelectric safety switch guarding the access to a palletizer in the beverage industry

# Photoelectric Safety Switches

# OK OPTIC-FI FOTRONIC

# Photoelectric Safety Switches Mode of Operation

Photoelectric safety switches such as the WSU/WEU 26 are throughbeam devices consisting of a separate light source (WSU) and light receiver (WEU). Between the source and the receiver, the light beam safeguards danger areas.

In order to fulfill their role, the photoelectric switches need to be self-monitoring, i.e. faults in the device itself have to be detected and issued as a "Stop" command to the control unit of the machine or equipment constituting a hazard.

Control of the machine also needs to be self-monitoring: when there is a fault on the control system, no further dangerous movement must be executed. After switch-on and a "Stop" command, it should only be possible to initiate the dangerous movement again via a control device (restart lock).

Development and production of the devices correspond to recognized standards of technology. If the user

observes the prescribed conditions of use, he will be adequately protected.

When using a photoelectric safety switch, one has to bear in mind that humans must not have access to the danger area until movement has ceased. A safety distance (S) consequently has to be maintained, calculated from:

$$S = v (t_1 + t_2) + 1000*$$

#### where:

S = safety distance (mm)

v = speed of approach (m/s) (recommended 1.6 m/s)

 $t_1 = machine stop time (ms)$ 

 $t_2$  = response time of WEU (20 ms)

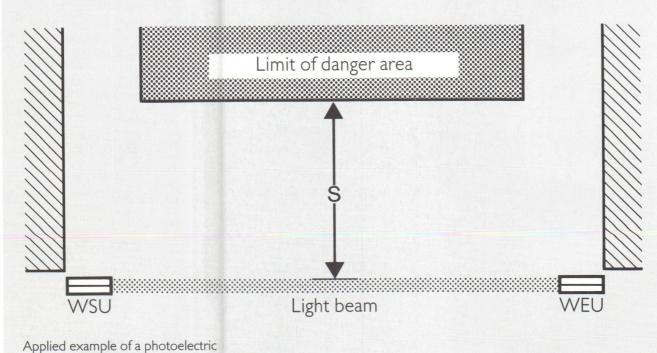
The safety distance must consequently be at least 1000 mm.

In the case of photoelectric switches with a relay output, at least two outputs have to be connected to the machine's control unit. A relay

(electromagnetic switching device) is allocated to each of the two outputs (normally-open contacts).

After the machine is switched on, a starting test must be performed before the first dangerous movement. Such a test must be conducted at least once every 24 hours.

\* See also UK standard PM 41



Applied example of a photoelectric safety switch with safety distance S from danger area.

# WSU 26 / WEU 26 Photoelectric Safety Switch



Through-beam photoelectric switch in die-cast housing for protecting personnel in the access area of power-driven machinery. The device is self-monitoring, i.e. faults in the device are detected and transmitted to the machine's control system as a "Stop" command.

It is available with PG connector or plug connector.

The WSU/WEU 26 Photoelectric Safety Switch must not be used for finger- or hand-protection.



Power indicator on WSU26 (sender). Signal-strength and status indicators on WEU 26 (receiver).



There are two WSU models: one for an operating range of 0 to 30 m, and one for 30 to 60 m.



#### **Scanning Distance**

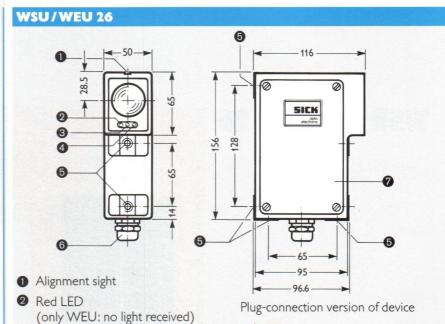


30/60 m



#### **Features**

- Non-contact safety device
- Test input
- LED power and signal strength indicators
- Blinking LED signal strength indicator (yellow) to show misalignment or dirt built-up on optics
- "Captive" relay contacts
- Direct voltage or alternating voltage version
- Lens heater
- Metal housing
- "Conformity Certificates":
   Federal Republic of Germany
   France
   Great Britain
   Holland
   Sweden
   Switzerland



Yellow LED (WSU: sender on: WEU: sufficient light received)

4 Green LED (only WEU: beam uninterrupted)

Threaded mounting holes M 6, 8 mm deep

6 PG 13.5 cable gland (for cable diameter 7 to 15 mm)

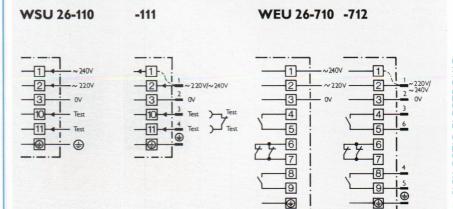
Cover and terminal strip accessible from this side

For cable receptacle (accessories), right angle, Part No. 6006 613, and straight, Part No. 6006 612,

see page 139.

For mounting bracket (accessories), Part No. 2007 900, see page 147. For dust shield (accessories), Part No. 1003 556, see page 152. For snow shield (accessories), Part No. 1003 619, see page 152. Corner mirror PSK 1 (accessories), Part No. 1005 229.

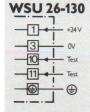
#### **Connection Diagram**

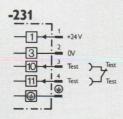


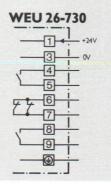
# WSU 26 / WEU 26 Photoelectric Safety Switch

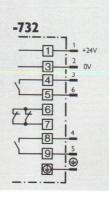
WSU/WEU 26	WSU 26 Sender			WEU 26 Receiver				
Model	-110	-111	-130	-231	-710	-712	-730	-732
Part No.	1005 084	1005 808	1005 086	1005700	1005 092	1005 814	1005 094	100570
Type of connection $(T/P)^{1)}$	T	Р	T	Р	T	Р	T	P
Cable receptacle, Part No.		6006 612 6006 613	2	6006 612 6006 613	13400	6006 612 6006 613	1	6006612
Mounting bracket, Part No.	2007 900			1 0000015		1 0000013		1 0000013
Scanning range	0 to 30 m			30to 60 m				
Supply voltage V <sub>S</sub>	220/240 V	220/240 VAC <sup>2)</sup> 24 VDC <sup>3)</sup>		220/240 V	'AC <sup>2</sup> )	24 VDC <sup>3)</sup>		
Power consumption	5 VA		3 W		7 VA		5 W	
Ripple			≦5 V <sub>pp</sub>				≦5 V <sub>pp</sub>	
Light source	LED, infrai	red, modulat			Jan 1		PP	
Angle of dispersion / angle of reception	<b>≤</b> 4°			<b>≤</b> 4°				
Indicator (sender on)	LED, yello	LED, yellow						
Indicator (beam uninterrupted)				LED, green				
Indicator (beam interrupted)	-			LED, red				
Indicator (light received)				LED, yellow				
Sufficient light received				permanently on				
Insufficient light received	-			blinking				
Switching outputs					1NC,2×NO	2xNO	1NC,2xNO	2×NO
Switching voltage max./min.					250 VAC/24 VDC			
Switching current max./min.					2 A / 0.02 A			
Switching power max. <sup>4)</sup>					500 VA			
Response time; switching frequency max. <sup>5)</sup>					≤20 ms, 10/s			
Enclosure rating	IP 67	IP 65	IP 67	IP 65	IP 67	IP 65	IP 67	IP 65
Lens heater	standard				- 1964			
Ambient operating temperature	-25  to  +5	55°C						
Storage temperature	-40  to  +7	′5°C						
Climate class rating (DIN 40040 / see IEC 68)	Е							
Mechanical stability (DIN 40040 / see IEC 68)	Class V							
Housing	die-cast alu	minium						
Housing color	RAL 10-21 cadmium yellow			- 3/12				
nstallation orientation	any							
Weight	approx. 0.9	to 1.2 kg			approx. 1.0	to 1.2 kg		
1) T = terminal chamber P = plug connection to DIN 43 651 2) +10 to -15%	3) ±20% 4) Provide sui capacitive le	table arc suppre oads	ssion with induc	tive or		dark time ratio o	of1:1	

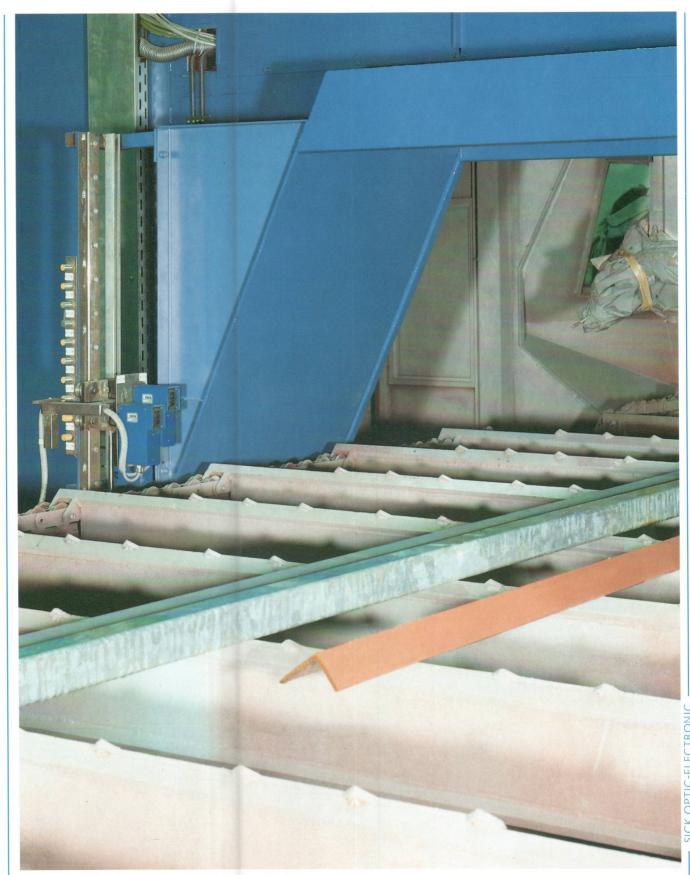
For further versions, see Technical Description of WSU 26/WEU 26 (available on request). Always observe the conditions of use indicated in this description.











198 WL 25 Exi photoelectric reflex switch for areas prone to explosions controlling a lac smearing machine

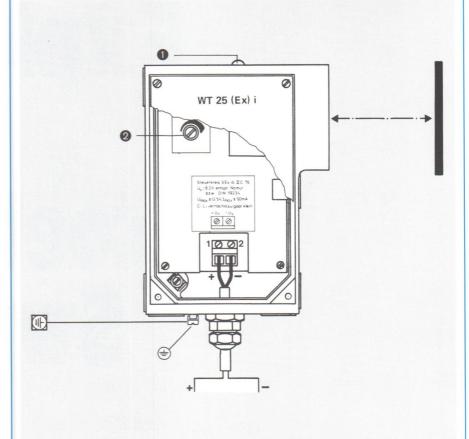
# Explosionproof Photoelectric Switches

## **Explosion-proof Photoelectric Switches**

In areas prone to explosions, electrical equipment has to satisfy special conditions, as laid down in DIN 19234.

The WL 25 Ex i photoelectric reflex switch and WT 25 Ex i photoelectric proximity switch are designed for use in such areas. The special (electrical) feature of these devices is that their information is only relayed via a two-wire connection, conforming to NAMUR guidelines (Standardizing body for measurement and control engineering). The basic principle of these explosion-proof photoelectric switches is in fact the statusdependent control current - the current consumption varies as a function of the status. When light is received (uninterrupted beam with through-beam switch; scanned object present in the case of proximity switch), the current consumption rises above 2.2 mA; when no light is received, current consumption falls below 1 mA.

The status-dependent current consumption has to be evaluated by the KN 25 (Ex) isolation switching amplifier. Unlike the explosion-proof photoelectric switches and proximity switches, the switching amplifier is only permitted to be installed outside explosion-prone areas.



- Status indicator
- Sensitivity control

Switching mode	light-switching	
Light received	yes	no
Status indicator	on	off
Control current	≥2.2 mA	≦1 mA

Switching mode	light-switching		
Light beam	uninterrupted	interrupted	
Status indicator	on	off	
Control current	≥2.2 mA	≦1 mA	

# W 25-Series Explosion-proof Photoelectric Switches



WT25 Exi



17

17 m



0 to 1000 mm



Photoelectric switches in metal housing for use in areas prone to explosions. Conforming to DIN 19234.

With sensitivity control and status indicator.

Status-dependent control current.

PTB Conformity Certificate (Federal Physico-Technical Institute). The status-dependent current consumption has to be evaluated by the KN 25 (Ex) isolation switching amplifier.

Enclosure rating IP 67 (dusttight, watertight). Supply voltage range 5 to 13.5 V.

Available as photoelectric switch and proximity switch.



Inside the WL 25 Ex i



Safety proved by PTB Conformity Certificate

SICK OPTIC-ELECTRONIC





#### **Scanning Distance**

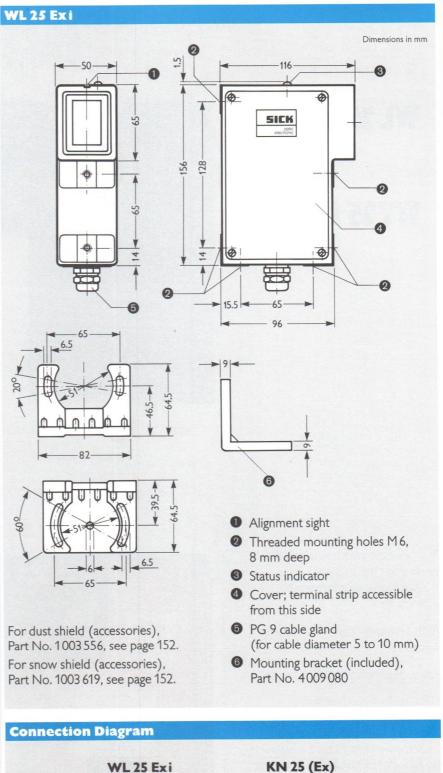


17 m



#### **Features**

- Classification EEx ib II C T 6, PTB No. Ex-81/2011
- Status-dependent control current (in accordance with NAMUR and DIN 19234)
- Light-switching
- Adjustable sensitivity
- Status indicator
- Die-cast housing



+5 to 13.5 V

#### WL 25 Exi Part No. 1004116 Type of connection<sup>1</sup>) terminal chamber Scanning distance<sup>2</sup>) With PL 80 reflector 25/16 m With PL 50 reflector 17/10 m Supply voltage V<sub>s</sub> 8.2 (5.0 to 13.5) VDC3) Current consumpt. (uninterrupted beam) ≥2.2 mA Current consumpt. (beam interrupted) ≤1.0 mA ≤ 0.43 V<sub>pp</sub> Ripple<sup>4</sup>) Light source LED, infrared, modulated, average service life approx. 100,000 h<sup>5</sup>) Light spot diameter approx. 100 mm at a distance of 6 m Light receiver switching mode light-switching Sensitivity adjustable Status indicator LED, red **Switching outputs** status-dependent control current (in acc. with NAMUR and DIN 19234) Response time; switching frequency<sup>6</sup>) ≤5 ms; max. 100/s IP 67 **Enclosure rating Explosion protection** E Ex ib IIC T6 PTB No. Ex-81/2011 Circuit protection supply connections reverse-polarity protected; interference suppression Ambient operating temperature -40 to +75°C Storage temperature -40 to +75°C Weight approx. 950 g Supply via KN 25 (Ex) isolation switching amplifier Typical limiting scanning distance (laboratory value) / recommended normal-service scanning distance under industrial conditions 3) Limit values 4) Must be within V<sub>s</sub> tolerances 5) At room temperature = +25°C 6) With light/dark time ratio of 1:1

#### Physikalisch-Technische Bundesanstalt



#### KONFORMITÄTSBESCHEINIGUNG

PTB Nr. Ex-81/2011

Diese Bescheinigung gilt für das elektrische Betriebsmitte

Lichtschranke Typ WL 25 Ex

der Firma Erwin Sick GmbH D7808 Waldkirch

Die Bauart dieses elektrischen Betriebsmittels sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Konformitätsbescheinigung festgleefgt.

Die Physikalisch-inschies Bundeanstalt bescheinen gla a Prütsfelle nach Artikel 14 der Richtlinie des Rates der Europäischen Gemeinschaften vom 16. Dezember 1975 (76/117/EWG) die Übereinstimmung dieses elektrischen Betrebsmittels mit den harmonisierten Europäischen Normen Elektrische Betriebamittel für explosionsgefährdete Bereiche

EN 50 014-1977 / VDE 0171 Teil 1/5.78 Allgemeine Bestimmungen EN 50 020-1977 / VDE 0171 Teil 7/5.78 Eigensicherheit "i"

EEx ib II C T6

Der Hersteller ist dafür verantwortlich, daß jedes derart gekennzeichnete Betriebsmittel in seiner Bauart mit den in der Anlage zu dieser Bescheinigung aufgeführten Prüfungsunterlagen überein-stimmt und daß die vorgeschriebenen Stückprüfungen erfolgreich bestanden wurden. Das elektrische Betriebsmittel darf mit dem hier abgedruckten gemeinschaftlichen Unterschei-dungszeichen gemäß Anhang II der Richtlinie des Rates vom 6. Februar 1979 (79/196/EWG) ankennzeichen werden.



Braunschweig, 30.1.1981

#### Federal Institute of Physics and Technology (PTB)

Conformity Certificate

PTB No. Ex-81/2011

This certificate is valid for the following electrical equipment

WL 25 Ex photoelectric reflex switch

manufactured by: Erwin Sick GmbH D-7808 Waldkirch Federal Republic of Germany

The construction of this electrical equipment, as well as the various permissible designs, are described in the Attachment to this Certificate. According to Article 14 of the Standards of the Council of the European Community, dated 18 December 1975 (76/117/EWG), the Federal Institute of Physics and Technology (PTB), as an inspection office, certifies that this electrical equipment is in accordance with the unified European Standards on

EN 50 014-1977 / VDE 0171 section 1/5.78 General regulation EN 50 020-1977 / VDE 0171 section 7/5.78 Intrinsical safe, "in

The equipment must be labelled as follows:

EEx ib II C T6

The manufacturer is responsible that the construction of all equipment so marked agree with the test documents listed in the Attachment and that the prescribed unit tests have been successfully completed.

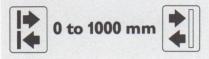
The electrical equipment may be identified with the distinctive marking printed here, in accordance with Supplement II to the council guidelines of February 6, 1979 ( 79/196/EWG).

(stamped with the official seal of the Federal Institute of Physics and Technology)



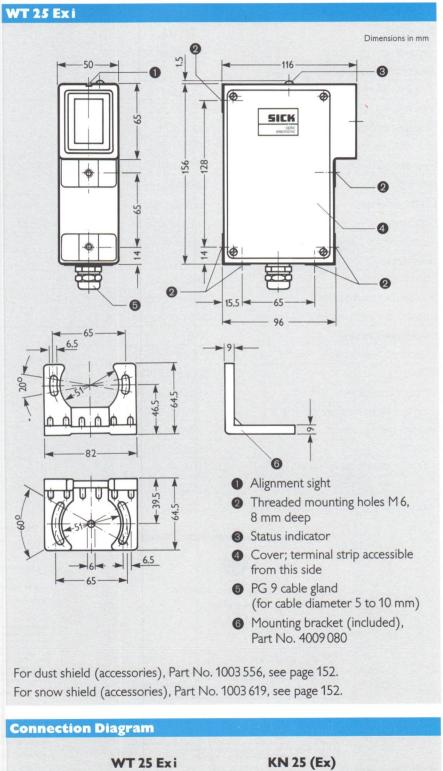


#### **Scanning Range**



#### **Features**

- Classification E Ex ib II C T 6, PTB No. Ex-81/2185
- Status-dependent control current (in accordance with NAMUR and DIN 19234)
- Light-switching
- Adjustable sensitivity
- Status indicator
- Die-cast housing



1

+5 to 13,5 V

9

WT 25 Exi		
Part No.	1004673	
Type of connection	terminal chamber	
Scanning range <sup>1</sup> ) <sup>2</sup> )	0 to 1000 mm / 10 to 650 mm	
Supply voltage V <sub>s</sub> <sup>3</sup> )	8.2 (5.0 to 13.5) VDC <sup>4</sup> )	
Current consumpt. (uninterrupted beam)	≥2.2 mA	
Current consumpt. (beam interrupted)	≦1.0 mA	
Ripple <sup>5</sup> )	≤0.43 V <sub>pp</sub>	
Light source	LED, infrared, modulated, average service life approx. 100,000 h <sup>6</sup> )	
Light spot dimensions	approx. 12 x 12 mm <sup>2</sup> at a distance of 650 mm	
Light receiver switching mode	light-switching	
Sensitivity	adjustable	
Status indicator	LED, red	
Switching outputs	status-dependent control current (in acc. with NAMUR and DIN 19234	
Response time; switching frequency <sup>7</sup> )	≦5 ms; max. 100/s	
Enclosure rating	IP 67	
Explosion protection	E Ex ib IIC T6	
PTB No.	Ex-81/2185	
Circuit protection	supply connections reverse-polarity protected; interference suppression	
Ambient operating temperature	−10 to +40°C	
Storage temperature	-25 to +75°C	
Weight	approx. 950 g	
1) Typical limiting scanning range (Jahoraton; value) /	4) Limit values	

- Typical limiting scanning range (laboratory value) / recommended normal-service scanning range under industrial conditions
   Based on white standard
   Supply via KN 25 (Ex) isolation switching amplifier

- 4) Limit values
   5) Must be within V<sub>s</sub> tolerances
   6) At room temperature = +25°C
   7) With light/dark time ratio of 1:1

#### Physikalisch-Technische Bundesanstalt



#### KONFORMITÄTSBESCHEINIGUNG

PTB Nr. Ex-81/2185

Diese Bescheinigung gilt für das elektrische Betriebsmittel Lichtschranke

der Firma Erwin Sick GmbH D-7808 Waldkirch

Die Bauart dieses elektrischen Betrebsmittels sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Konformitätisbescheinigung festgeleigt. Die Physikalischerischensische Bundeanstalt bescheinig ist aprüfstelle nach Artikel 14 der Richt-linie des Rates der Europaischen Gemeinschaften vom 18. Dezember 1975 (76/117/EWG) die Über-einstimmung dieses elektrischen Betrebsmittels mit den harmonisierne Europäischen Normen Elektrische Betriebsmittel für zeptosionsgefahrdete Bereichie

EN 50 014-1977 / VDE 0171 Teil 1/5.78 Allgemeine Bestimmungen EN 50 020-1977 / VDE 0171 Teil 7/5.78 Eigensicherheit "i"

Das Betriebsmittel ist mit dem folgenden Kennzeichen zu versehen

Der Hersteller ist dafür verantwortlich, daß jedes derart gekennzeichnete Betriebsmittel in seiner Bauart mit den in der Anlage zu dieser Bescheinigung aufgeführten Prüfungsunterlagen übereinstimmt und daß die vorgeschriebenen Stückprüfungen erfolgreich beständen wurden.



#### Federal Institute of Physics and Technology (PTB)

PTB No. Ex-81/2185

This certificate is valid for the following electrical equipment,

Photoelectric proximity switch, WT 25 Ex i

The construction of this electrical equipment, as well as the various permissible designs, are described in the Attachment to this Certificate. According to Article 14 of the Standards of the Council of the European Community, dated 18 December 1975 (76/117/EWG), the Federal Institute of Physics and Technology (PTB), as an inspection office, certifies that this electrical equipment is in accordance with the unified European Standards on

EN 50 014-1977 / VDE 0171 Section 1/5.78 General regulations EN 50 020-1977 / VDE 0171 Section 1/5.78 Intrinsically safe, "i"

following successful design testing. The results of this testing are recorded in a confidential test record.

The equipment must be labelled as follows:

#### EEx ib II C T6

The manufacturer is responsible that the construction of all equipment so marked agree with the test documents listed in the Attachment and that the prescribed unit tests have been successfully completed.

The electrical equipment may be identified with the distinctive marking printed here, in accordance with Supplement II to the council guidelines of February 6, 1979 (79/196/EWG).

Braunschweig, 7 Dec. 1981

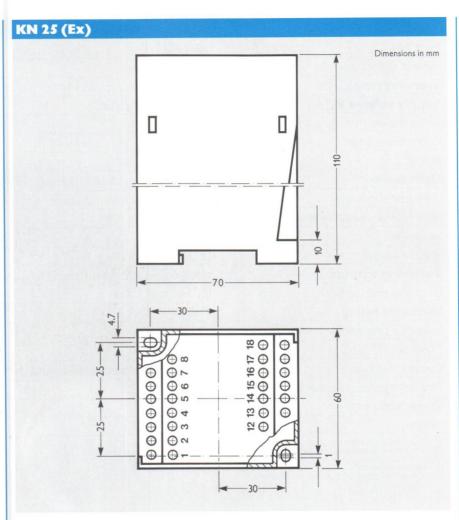
(stamped with the official seal of the Federal Institute of Physics and Technology)





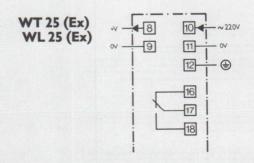
#### **Features**

- Power supply and switching amplifier for photoelectric switches and proximity switches to DIN 19234
- Switching amplifier for statusdependent control current
- Light- and dark-switching
- Relay output
- Available with or without time delays
- Separately adjustable time delays
- Classification [EEx ib] II C, PTB No. Ex-82/2043
- Noryl SEO plastic housing



#### **Connection Diagram**

#### KN 25 (Ex)



#### Note

The device must only be operated outside explosion-prone areas. The housing is suitable for wall-mounting using two holes, in accordance with DIN 43604, or for snap-on mounting on standard rails, in accordance with DIN 46277. Max. cable cross-section for screw terminals 4 mm<sup>2</sup>.

# KN 25 (EX)

# **Isolation Switching Amplifier**

KN 25 (Ex)	-1	-2	
Part No.	1004553	1004554	
Supply voltage V <sub>S</sub>	220 VAC (-15 to +10%)		
Line frequency	47 to 63 Hz		
Power consumption	3.5 VA		
Fuse	250 VT 0.032 Ex C		
Outputs / inputs for WL/WT 25 Exi	for status-dependent control current		
No-load voltage	8.2 VDC (max. 13.5 V)		
Control	control current ≥2.2 mA/≤1 mA		
Short circuit current	10 mA (max. 47 mA)		
Permissible external capacitance, max.	660 nF		
Permissible external inductance, max.	13 mH		
Switching output <sup>1</sup> )	SPDT, electrically isolated		
Switching voltage max.	250 VAC		
Switching current max.	4 A		
Switching power max.	1000 VA		
Mode: light-switching (L)	jumper, terminals 2–3		
Mode: dark-switching (D)	jumper, terminals 1-2		
Time delay	- ON- and OFF-delay		
Time delays		0.1 to 15 s <sup>2</sup> )	
Separately adjustable with	- 20-turn potentiometer		
Explosion protection	[EEx ib] IIC		
PTB No.	Ex-82/2043		
Enclosure rating	IP 20		
Ambient operating temperature	−10 to +40°C		
Storage temperature	-25 to +75 °C		
Weight	270 g 300 g		
Provide suitable arc suppression with inductive or capacitive loads	2) Min. 10 s		

#### Physikalisch-Technische Bundesanstalt



#### KONFORMITÄTSBESCHEINIGUNG

PTB Nr. Ex- 82/2043

Diese Bescheinigung gilt für das elektrische Betriebsmittel Trennschaltgerät Typ KN 25 ex

der Firma Erwin SICK GmbH D-7808 Waldkirch

Elektrische Betriebsmittel für explosionsgefährdete Bereiche

EN 50 014-1977 / VDE 0171 Teil 1/5.78 Allgemeine Bestimmungen EN 50 020-1977 / VDE 0171 Teil 7/5.78 Eigensicherheit "i"



#### Federal Institute of Physics and Technology (PTB)

PTB No. Ex-82/2043

This certificate is valid for the following electrical equip-

KN 25 (Ex), switching amplifier

manufactured by: Erwin Sick GmbH D-7808 Waldkirch Federal Republic of Germany

The construction of this electrical equipment, as well as the various permissible designs, are described in the Attachment to this Certificate. According to Article 14 of the Standards of the Council of the European Community, dated 18 December 1975 (76/117/EWG), the Federal Institute of Physics and Technology (PTB), as an inspection office, certifies that this electrical equipment is in accordance with the unified European Standards on

#### Electrical equipment for hazardous areas

EN 50 014-1977 / VDE 0171 Section 1/5.78 General regulations
EN 50 020-1977 / VDE 0171 Section 7/5.78 Intrinsically safe, "i"

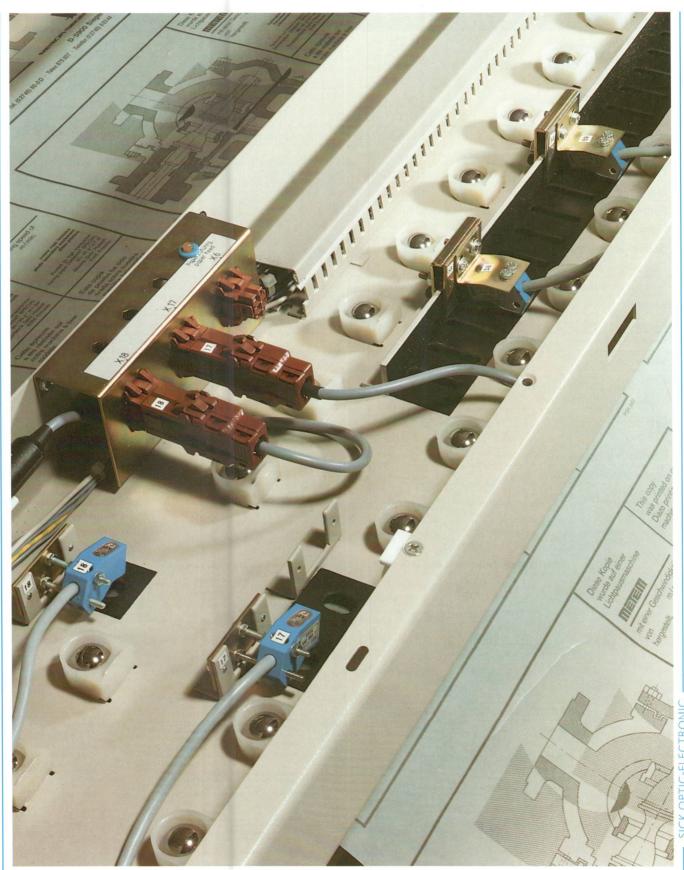
following successful design testing. The results of this testing are recorded in a confidential test record.

The equipment must be labelled as follows:

The manufacturer is responsible that the construction of all equipment so marked agree with the test documents listed in the Attachment and that the prescribed unit tests have been successfully completed.

(authorized signature)

Braunschweig, 16. Sept. 1982



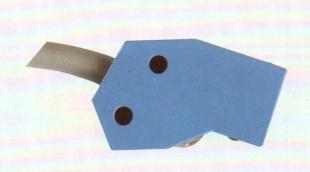
208 RP1 angular reflection scanner controlling the working process in a blueprinting machine

## RP 1-11 Angular Reflection Scanner





9 mm

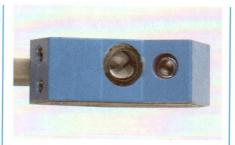


Angled photoelectric switch in metal housing with in-line amplifier in plastic housing. Focussed beam for high switching accuracy.

Easily replaceable lamp module.

Enclosure rating IP 65 (dusttight, waterproof); in-line amplifier IP 40. Supply voltage range 10 V to 30 V; incandescent lamp 3 VAC/DC.

Switching output load up to 200 mA. Light-switching. Max. switching frequency 1000/s.



Light beams are focussed at point of intersection of light sender and light receiver.



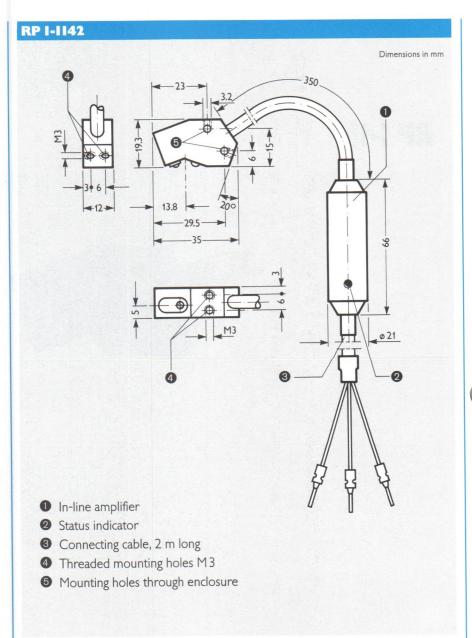
#### **Scanning Distance**

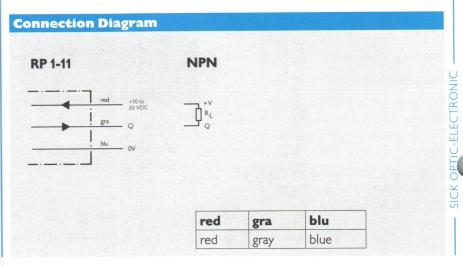


9 mm

#### **Features**

- Supply connections reversepolarity protected
- In-line amplifier
- Light-switching
- Status indicator
- Transistor output short circuit protected
- Simple fitting
- Angular reflection scanner in metal housing
- In-line amplifier in plastic housing

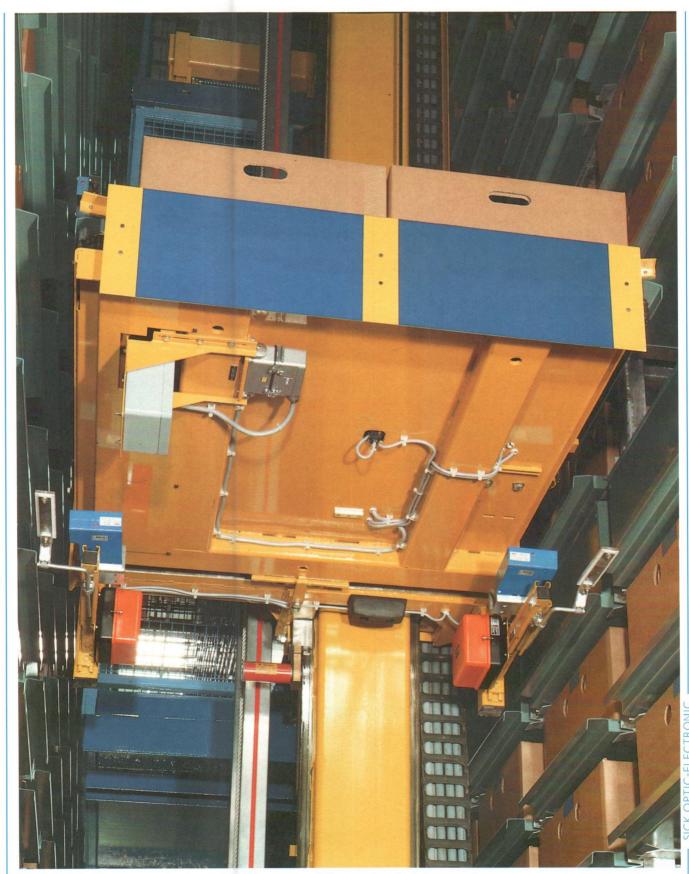




## **RP 1-1142 Angular Reflection Scanner**

RP I	-1142	
Type of connection	cable	
Scanning distance	9±3 mm	
Supply voltage V <sub>S</sub>	10 to 30 VDC <sup>1</sup> )	
Current consumption	60 mA	
Ripple max. <sup>2</sup> )	4 V <sub>pp</sub>	
Light source	Ga-As-diode, IR, average service life ≥ 100,000 h³)	
Light spot dimensions	approx. 2 x 5 mm <sup>2</sup> at a distance of 9 mm	
Light receiver switching mode	light-switching	
Status indicator <sup>4</sup> )	LED, red	
Switching output <sup>4</sup> )	NPN	
Signal voltage HIGH	approx. V <sub>S</sub>	
Signal voltage LOW	≦2 V	
Switching frequency <sup>5</sup> ); output current	max. 1000/s; max. 200 mA	
Enclosure rating Scanner	IP 65	
In-line amplifier	IP 40	
Circuit protection	supply connections reverse-polarity protected; output Q short circuit proof	
Ambient operating temperature <sup>6</sup> )	-20 to +55 °C	
Storage temperature <sup>6</sup> )	-20 to +70°C	
Connecting cable	2 m, 3 x 0.14 mm <sup>2</sup> , PVC, O.D. 5 mm, shielded signal conductor	
Weight	approx. 120 g	

1) Limit values
2) Must be within V<sub>5</sub> tolerances
3) At room temperature = +25°C
4) In in-line amplifier
5) With light/dark time ratio of 1:1
6) Do not distort cable below 0°C
5witching amplifiers for mains connections: KN 1, BP/NP



212 PFK 1 final positioner provides precise positioning in a fully automatic high-bay warehouse

### PFK 1 Final Positioner

### PFK 1





400 mm



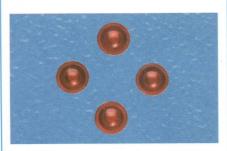
The PFK 1 final positioner is a special photoelectric reflex switch which is suitable as a control device for drives in delivery systems, loading platforms, etc. The PFK 1 undertakes fine positioning after the central control system has executed preliminary positioning. Alignment is performed using a reflector attached to the target object.

The switching point has a reproducibility of  $\pm 0.25$  mm.

Up to 0.5 m/s is permitted as the relative speed in relation to the reflector.

The reception area at a 300 mm scanning distance is  $90 \times 90 \text{ mm}^2$  (120 × 120 mm<sup>2</sup> on PFK 1-2).

Four light emitting diodes indicate the possible switching functions (positions) in the four quadrants. A further LED indicates that a reflector is present in the field of vision. An inhibit input is used for inhibition and release of the fine positioning.



Four light emitting diodes indicate the possible positions of the positioner in relation to the reflector.

The device is largely insensitive to reflecting surfaces, thereby permitting reliable detection of the reflector, even on a galvanized background.



Terminal chamber and cable connection; enclosure rating IP 67 (dusttight, watertight).

SICK OPTIC-ELECTRONIC



#### **Scanning Distance**

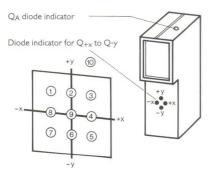


400 mm



#### **Features**

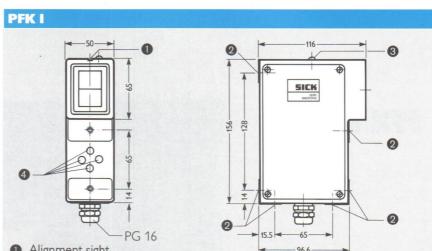
- Insensitive to reflecting surfaces, thereby reliable detection of reflector, even on galvanized background
- Switching output short circuit proof
- Supply connections reversepolarity protected
- Metal housing
- High positioning accuracy in four quadrants



Possible reflector positions in field of vision (1 to 9) and outside it (10)

Position	E/I	$Q_{+x}$	$Q_{-x}$	Q <sub>+y</sub>	Q_y	QA
1	Н	L	Н	Н	L	L
2	Н	L	L	Н	L	L
3	Н	Н	L	Н	L	L
4	Н	Н	L	L	L	L
5	Н	Н	L	L	Н	L
6	Н	L	L	L	Н	L
7	Н	L	Н	L	Н	L
8	Н	L	Н	L	L	L
9	Н	L	L	L	L	L
10	Н	L	L	L	L	Н
Δ	L	L	L	L	L	Н

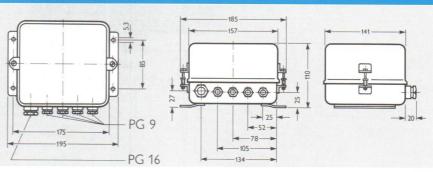
 $\Delta =$  any position

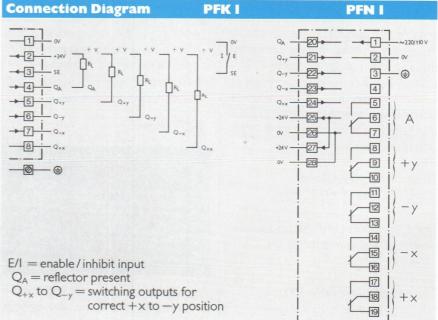


- Alignment sight
- 2 Threaded mounting holes M 6, 8 mm deep
- 3 Status indicator: reflector present
- 4 Status indicator: correct +x, -x, +y, -y position

For mounting bracket (included), Part No. 4009 080, see page 147. For reflectors (accessories), see page 144.







# PFK 1 Final Positioner PFN 1 Switching Amplifier

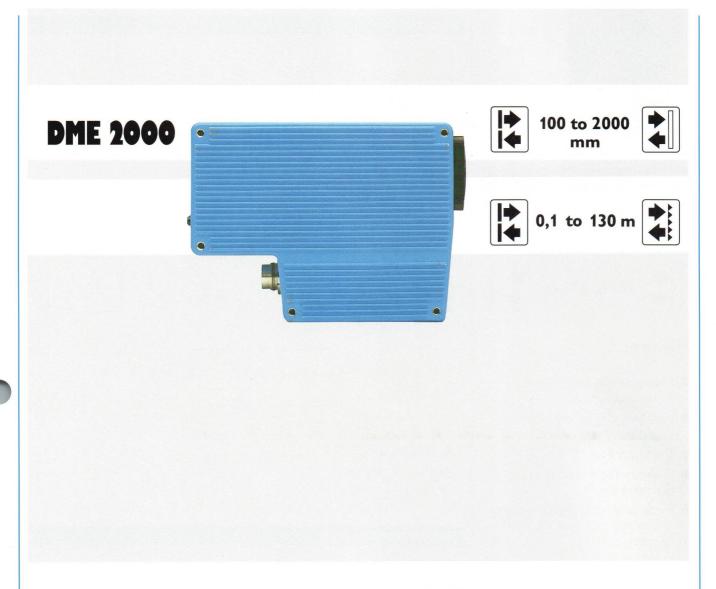
PFK I	-1	-2	-3
Part No.	1003 297	1004372	1004609
Type of connection	terminal chamber		
Reflectors <sup>1</sup> )	Ø 22 mm		
PL 22-1 Part No.	1003 546		
PL 22-2 Part No.	1003 621		
PL 22-3 Part No.	1003 488		
Scanning distance	300 mm, ±100 mm	400 mm, ±100 mm	200 mm, +100 mm, -70 mm
Reproducibility of switching point	± 0.25 mm		
Target-circle diameter for correct position	<b>≦</b> 3 mm	5 to 6 mm	
Reception area at 300 mm scann. dist.	$90 \times 90 \text{ mm}^2$	120 × 120 mm <sup>2</sup>	90 × 90 mm <sup>2</sup>
Scanning angle	±10° in all axes perper	ndicular to reflector	
Relative speed in relation to reflector, max.	0.5 m/s		
Supply voltage V <sub>S</sub>	24 VDC (±20%)		
Current consumption (no load)	≦150 mA		
Switching outputs	Q+x, Q-x, Q+y, Q-y and	d Q <sub>A</sub>	
Switching current per output	≦100 mA		
Signal voltage HIGH	+V <sub>S</sub>		
Signal voltage LOW	≦2.5 V		
Inhibit input LOW level (inhibit)	≦3 V		
HIGH level (enable)	≥15 V or not connected		
Perm. potent. diff. between 0 V and housing	60 VAC		
Enclosure rating	IP 67		
Ambient operating temperature	$-10 \text{ to } +55 ^{\circ}\text{C}^2$		
Storage temperature	-25 to +75℃		
Take nature of mounting into account	Account is not taken of the poss when there is a sudden rise in the	ible formation of condensation on the c ie ambient temperature and the air hun	outside of the objective lens nidity is at an appropriate level.

PFN I	-1	<b>-2</b>	
Part No.	1003 298	1003 530	
Supply voltage V <sub>S</sub>	220 VAC (+10%, -15%)	110 VAC (+10%, -15%)	
Line frequency	48 to 62 Hz		
Power consumption	approx. 11 VA		
Output voltage <sup>1</sup> )	24 VDC (max. load) / 35 VDC (no load)		
Alternating-voltagecomponentatmax.load	≦2 V <sub>pp</sub>		
Output current	≦200 mA		
Switching outputs	5 relays, each SPDT		
Relay is energized with	setting with LOW; energizing current 20 mA (DC)		
Switching function for	+x, -x, +y, -y position and reflector in detection range		
Switching voltage / switching current	≦250 V/≦3 A		
Switching power <sup>2)</sup>	≦300 VA		
Switching frequency max.3)	15/s		
Enclosure rating	IP 64		
Ambient operating temperature	-10 to +55 ℃		
Storage temperature	−25 to +75°C		
1) e.g. for final positioner PFK 1	Provide suitable arc suppression with inductive or     With scanning ratio of 1:1		



216 DME 2000 Distance Measuring Device measuring the distance at a gantry crane

## DME 2000 Distance Measuring Device



The DME 2000 is a high-precision opto-electronic instrument. It measures the transit time of light on the phase-correlation principle. It is provided with a red class-2 semiconductor laser. The 8-digit display indicates the measured value; external further processing of the information is carried out via the serial interface or the analogue current output. Two switching outputs with a freely adjustable switching hysteresis and threshold undertake direct control functions. A convenient menu-guide enables the user to match the parameters to individual automation tasks without difficulty.



Rear view of the DME 2000 showing 8-digit display and programming keys.

Thanks to its opto-electronical functioning principle, the DME 2000 is suitable for a wide variety of applications: e.g. for measuring profiles, the thickness, winding diameter, rotating objects, for determining the height of bulk material or content level (even explosion protection using a bull's eye), for sag sontrol, for measuring stack heights, for non-slip rail locomotive positioning.



#### Scanning distance



100 to 2000 mm



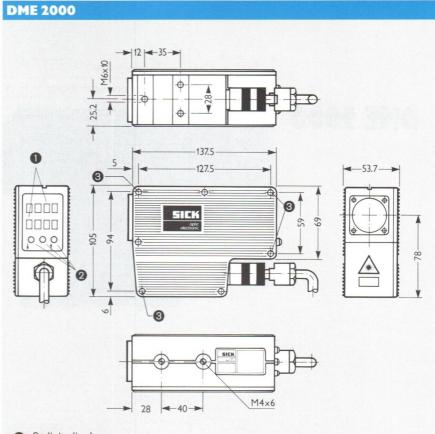


0.1 to 130 m



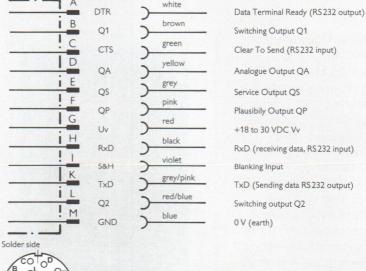
#### **Features**

- Distance measurement without any reactive effects
- Light transit-time measurement regardless of the surface
- Compact device, IP 65
- Visible red light used as an alignment aid
- Freely programmable parameters:
  - 2 switching outputs
     switching limit
  - hysteresis
  - offset
  - resolution/measuring rate
  - Scanning/reflector mode
- Serial interface
- 8-digit alphanumeric display
- Analogue output
- Laser class 2



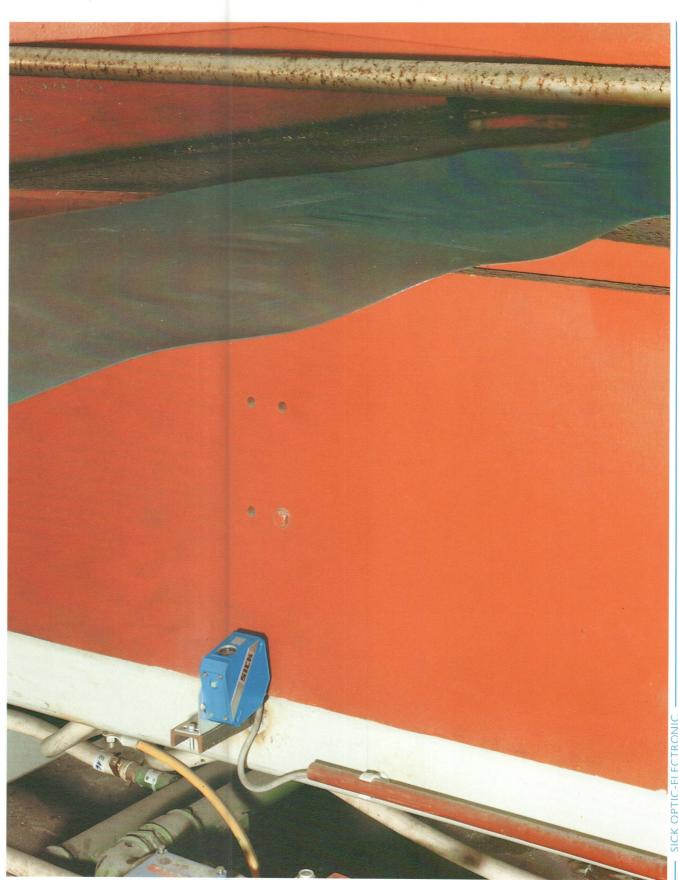
- 1 8-digit display
- 2 Programming keys
- Mounting holes (rear)

#### **Connection Diagram**



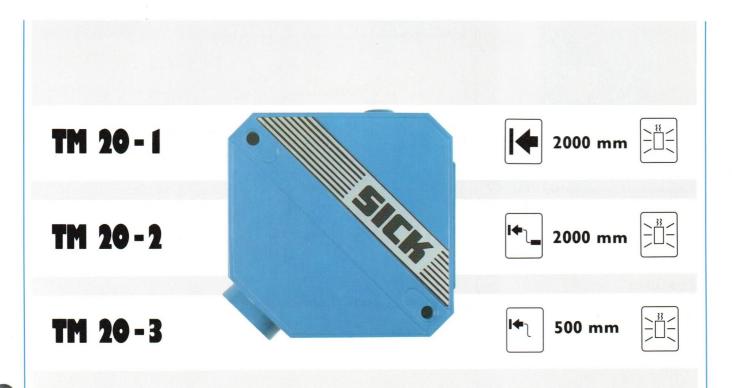
# DME 2000 Distance Measuring Device

DME 2000	
Supply voltage V <sub>s</sub>	18 to 30 VDC (limit values, reverse-polarity protected)
Ripple	5 V <sub>ss</sub>
Light source	< 6 W (without load)
Power consumption	Laser-diode (red light), Av. service life 50,000 h (at 25°C)
Laser protection class	2 (IEC 825 / VDE 0837)
Switching outputs Q <sub>1</sub> , Q <sub>2</sub> , Q <sub>P</sub> , Q <sub>S</sub>	PNP
Output voltage	$HIGH: V_s - <= 2 V / LOW: 0 V$
Output current	$I_{\text{max.}} = 100 \text{ mA}$ , short circuit protected
Capacitive load	C <sub>max.</sub> = 100 nF
Switching outputs Q <sub>1</sub> en Q <sub>2</sub>	can be inverted (Q/Q)
Switching limit	adjustable in mm steps
Switching hysteresis	adjustable in 2-mm steps; 0 to 254 mm
Plausibility output Q <sub>P</sub>	HIGH: correct measurement/LOW: measurement error
Service output Q <sub>S</sub>	HIGH: system o.k./LOW: Maintenance alarm
Blanking input S/H	HIGH: >= 10 V; <= U <sub>V</sub> / LOW: < 2V or blank HIGH: Storing measured values / LOW: unsolicited
Analogue output	0 to 20 mA of 4 to 20 mA
Serial interface	RS 232 (4,8 / 9,6 kBaud)
Enclosure rating	IP 65 (IEC 529)
EM-compatibility	IEC 801, level 3
Ambient temperature	-10+45°C
Storage temperature	-25+75°C
Weight	approx. 980 g



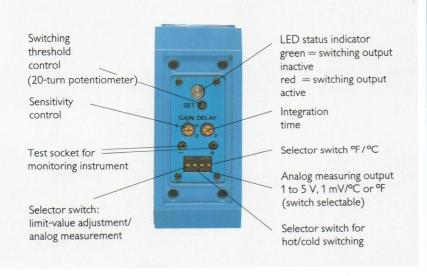
220 TM 20 Temperature Measuring Instrument monitoring the temperature of sheet metal in a mill

# Temperature Measuring Instruments TM 20



Temperature measuring instrument in metal housing with compact dimensions of only 32×77×77 mm.

Models with separate optic head and high enclosure rating; air/water cooler attachment for ambient temperatures up to 150 ° C.



Models with fiber-optic cable for cramped installation conditions; protection against inductive interference; lens adapter for small objects.

The TM 20 is a non-contact temperature measuring instrument which converts infrared radiation from any object into an electrical signal. The instrument is capable of measuring and switching, even with moving objects. Measuring range from 0° C to 2000° C, depending on the model.

Analog measuring output 1 to 5 V, or 1 mV/°C or °F (switch-selectable).

Limit-value output has adjustable switching threshold.



#### **Scanning Distance**



2000 mm

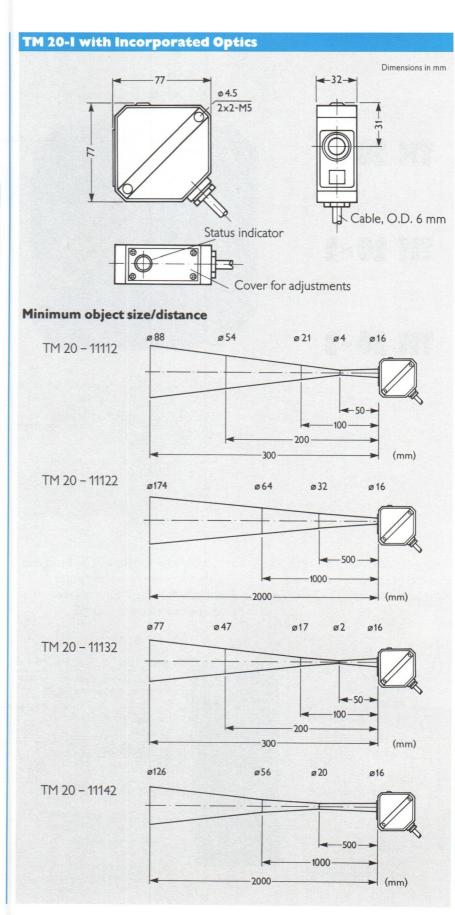


#### **Features**

- Built-in amplifier
- Status indicator
- Supply connections reversepolarity protected
- Photo-MOSFET/opto-coupler switching output for limit value
- Hot/cold switching selector
- Analog measuring output 1 to 5 V, 1 mV/°C or 1 mV/°F (switch-selectable)
- Adjustable amplification factor
- Adjustable integration time
- Temperature range 0 to 500° C or 150 to 500° C
- Setting and adjusting elements protected by cover plate
- Sturdy metal housing

#### **Applications**

- Particularly suitable for nonmetallic surfaces: rubber, plastics, paper, foodstuffs, etc.; equipment incorporates thermopile receiver (7 to 20 μm)
- Equipment with PBSe receiver particularly suitable for metal surfaces, rolls/drums; ceramics industry (1 to 4.8 μm)
- Temperature measurement possible through glass plates

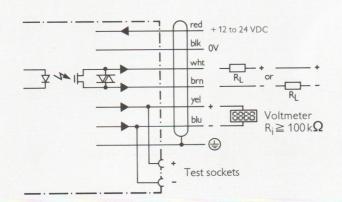


# Temperature Measuring Instrument TM 20-1

TM 20	-11112	-11122	-11132	-11142	
Part No.	6007810	6007811	6007812	6007813	
Temperature range	0 to 500 °C	0 to 500 °C			
Min. object size/distance <sup>1)</sup>	Ø4mm/50mm	Ø32 mm/500 mm	Ø2mm/50mm	Ø20mm/500mm	
Supply voltage	12 to 24 VDC ± 1	10%			
Current consumption	80 mA				
Receiver unit	Thermopile		PbSe		
Wavelength	7 to 20 μm		1.0 to 4.8 μm		
Lens material	Silicon				
Linearity ( $\varepsilon = 1$ )	±1.5% <sup>2)</sup>	±2.0% <sup>2)</sup>	$\pm 1.5\%^{2)}$	±2.0% <sup>2)</sup>	
Repetition accuracy	±0.2% <sup>2</sup> )				
Temperature drift	±0.08%/°C		±0.12%/°C		
Amplification factor	$1.0 \pm 0.8$ (variable)				
Analog output	1 to 5 V, 1 mV/°C or 1 mV/°F (switch-selectable)				
Response time (95%)	0.5 s		80 ms		
Integration time	0 to 7 s (variable)				
Limit-value switching output	Photo-MOSFET/	opto-coupler switch/	200 mA/30 VDC		
Enclosure rating	IP 66				
Vibration resistance	3 g (20 to 50 Hz)	)			
Permissible ambient temperature	0 to 50°C				
Storage temperature	$-20 \text{ to } +60 ^{\circ}\text{C}$				
Rel. humidity	Max. 85% withou	Max. 85% without condensation			
Weight	350 g				
Connecting cable	2 m, 6 x 0,25 mm	n <sup>2</sup> , Ø 7 mm			
Accessories (included)	1 mounting brack	cet			
See diagram opposite for other scanning distance and minimum object sizes	2) Based on measured va	lues in Kelvin			

#### **Connection diagram**

#### **TM 20**



red	blk	wht	brn	yel	blu
red	black	white	brown	yellow	blue

#### **Mode selector**

Switch position

	<b>A</b>
	+
2	] 🛕

Analog value for limit-value adjustment Continuous analog measurement



Hot switching Cold switching



Analog measuring output 1 to 5 V Analog measuring output 1 mV/°C



Analog measuring output 1 mV/°F
Analog measuring output 1 mV/°C

Hot switching:

limit-value switching output active above selected switching threshold

Cold switching:

limit-value switching output active below selected switching threshold



#### Scanning Distance



2000 mm



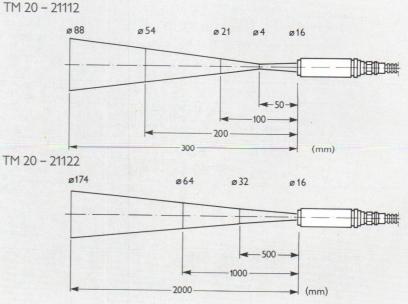
#### **Features**

- Built-in amplifier
- Status indicator
- Supply connections reversepolarity protected
- Photo-MOSFET/opto-coupler switching output for limit values
- Hot/cold switching selector
- Analog measuring output 1 to 5 V, 1 mV/°C or 1 mV/°F (switch-selectable)
- Adjustable amplification factor
- Adjustable integration time
- Temperature range 0 to 500° C
- Setting and adjusting elements protected by cover plate
- Sturdy metal housing
- Separate optic head
- Air/water cooler as accessory
- Designed for high mechanical and thermal stresses

#### **Applications**

- Particularly suitable for non-
- Metal surfaces up to 500°C
- metallic surfaces at high ambient temperatures, like the TM 20-1

# TM 20-2 with Separate Optic Head Dimensions in mm 2000 32 €-58-30 2×2-M5 Optic head Connecting cable Status indicator 64-Mounting bracket for separate optic head BEF-TM 20, Part No. 5304699 28 Minimum object size/distance



# TM 20-2 Temperature Measuring Instrument with Separate Optic Head

TM 20	-21112	-21122	
Part No.	6007814	6007 815	
Temperature range	0 to 500 °C		
Min. object size/distance <sup>1)</sup>	Ø4mm/50mm	Ø 32 mm/500 mm	
Supply voltage	12 to 24 VDC ± 10%		
Current consumption	80 mA		
Receiver unit	Thermopile		
Wavelength	7 to 20 μm		
Lens material	Silicon		
Linearity ( $\varepsilon = 1$ )	±1.5% <sup>2)</sup>		
Repetition accuracy	±0.2% <sup>2)</sup>		
Temperature drift	±0.08%/°C		
Amplification factor	1.0 ± 0.8 (variable)		
Analog output	1 to 5 V, 1 mV/°C or 1 mV	/°F (switch-selectable)	
Response time (95%)	0.5 s		
Integration time	0 to 7 s (variable)		
Limit-value switching output	Photo-MOSFET/opto-coup	ler/200 mA/30 VDC	
Enclosure rating	Separate optic head: IP 66; 6	electronics: IP 65	
Vibration resistance	3 g (20 to 50 Hz)		
Permissible ambient temperature	0 to 50°C (0 to 150°C with	water cooling)	
Storage temperature	$-20 \text{ to} + 60^{\circ}\text{C}$		
Rel. humidity	Max. 85% without condensati	ation	
Weight	800 g		
Connecting cable	2 m, 6 x 0.25 mm <sup>2</sup> , O.D. 6	mm	

#### **Accessories**

Mounting bracket (included)

black

white

brown

Mounting bracket for optic head BEF-TM 20, Part No. 5304699

Air/water cooler attachment for optic head SLV-TM 20, Part No. 5304 698, see page 228

Air/water cooler permits ambient temperature up to max. of 150°C

#### **Connection Diagram TM 20 Mode selector** Switch position red +12...24V blk ov Analog value for limit-value adjustment Continuous analog measurement brn Hot switching Cold switching 3 Voltmeter $R_i \ge 100 \,\mathrm{k}\Omega$ Analog measuring output 1 to 5 V Analog measuring output 1 mV/° Test sockets Analog measuring output 1 mV/°F Analog measuring output 1 mV/°C limit-value switching output active Hot switching: above selected switching threshold blu red blk wht brn yel limit-value switching output active Cold switching: yellow blue

below selected switching threshold

<sup>1)</sup> See diagram opposite for other scanning distances and minimum object sizes



#### **Scanning Distance**



500 mm

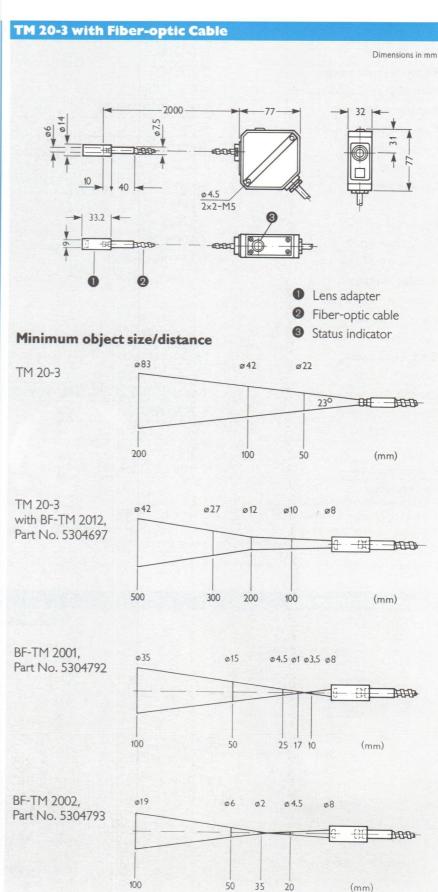


#### **Features**

- Built-in amplifier
- Status indicator
- Supply connections reversepolarity protected
- Photo-MOSFET/opto-coupler switching output for limit value
- Hot/cold switching selector
- Analog measuring output 1 to 5 V, 1 mV/°C or 1 mV/°F (switch-selectable)
- Adjustable amplification factor
- Adjustable integration time
- Temperature range 400 to 800 °C, 600 to 1200 °C, 1000 to 2000 °C
- Setting and adjusting elements protected by cover plate
- Sturdy metal housing
- Fiber-optic cable design
- For inductive environments
- Small space requirement
- Lens adapter for small objects (accessory)
- Fiber-optic cable thermally stable < 150 °C</li>

#### **Applications**

- For high material temperatures
- Metal surfaces
- Particularly suitable for use in aluminium processing industry
- For small objects



# TM 20-3 Temperature Measuring Instrument with Fiber-optic Cable

TM 20	-31182	-31162	-31172		
Part No.	6007 942	6007817	6007818		
Temperature range	400 to 800 °C	600 to 1200 °C	1000 to 2000 °C		
Min. object size / distance 1)	Ø 12 mm/200 mm v	vith BF-TM 2012			
Supply voltage	12 to 24 VDC ±10%				
Current consumption	50 mA	50 mA			
Receiver unit	PbS	Ge			
Wave length	1.0 to 1.6 μm				
Lens material	BK-7 glass lens				
Linearity ( $\varepsilon = 1$ )	±2.0% <sup>2)</sup>	±1.5% <sup>2</sup> )			
Repetition accuracy	±0.2% <sup>2)</sup>	±0.2% <sup>2</sup> )			
Temperature drift	±0.1%/°C ±0.04%/°C				
Amplification factor	1.0 ± 0.8 (variable)				
Analog output	1 to 5 V, 1 mV/°C o	1 to 5 V, 1 mV/°C or 1 mV/°F (switch-selectable)			
Response time (95%)	3 ms	5 ms			
Integration time	3 to 700 ms	5 to 50 ms			
Limit-value switching output	Photo-MOSFET/swit	ch/200 mA/30 VDC			
Enclosure rating	Fiber-optic cable: IP	66; electronics: IP 65			
Vibration resistance	3 g (20 to 50 Hz)				
Permissible ambient temperature	0 to 150°C (fiber-op	otic cable) and 0 to 50°C (ele	ctronics)		
Storage temperature	$-20 \text{ to } +60 ^{\circ}\text{C}$				
Rel. humidity	Max. 85% without co	Max. 85% without condensation			
Weight	400 g				
Connection cable	$2 \text{ m}, 6 \times 0.25 \text{ mm}^2, 0$	D. D. 7 mm			
Accessories					

Mounting bracket (included)

BF-TM 20 lens adapters (see diagram opposite)

#### **Connection Diagram TM 20 Mode selector** Switch position red + 12 to 24 VDC Analog value for limit-value adjustment blk ov Continuous analog measurement wht 2 Hot switching brn Cold switching $R_i$ ≥ 100 kΩ Analog measuring output 1 to 5 V Analog measuring output 1 mV/° Test sockets Analog measuring output 1 mV/°F Analog measuring 1 mV/°C Hot switching: limit-value switching output active above selected switching threshold red blk wht yel blu brn Cold switching: limit-value switching output active below selected switching threshold blue red black white brown yellow

See diagram opposite for other scanning distances and minimum object sizes

<sup>2)</sup> Based on measured values in Kelvin

#### Accessories

Mounting bracket for TM 20 (included)

Air/water cooler attachment for TM 20-2 (incl. mounting bracket) SLV-TM 20, Part No. 5304698

#### Air cooling

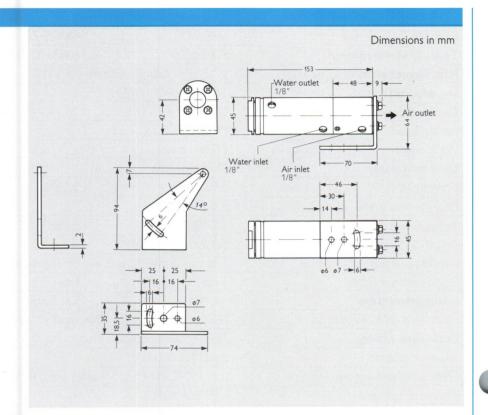
for ambient temperatures from 35 to 80°C

Air flow rate 50 to 150 NI/min Air inlet temperature 20°C Air pressure  $\leq$  2 bar

#### Water cooling

for ambient temperatures from 80 to 150°C

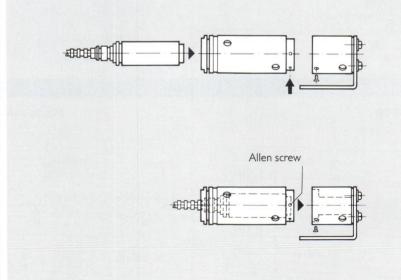
Water flow rate 0.5 to 2 l/min Water inlet temperature 30°C Water pressure ≤1 bar



#### Fitting instructions

Allen keys (1.5) for M3 screws Part No. 3502672

- Remove cooler housing after undoing the three Philips screws.
- Insert BS sensor into air/water cooler housing. Insertion is tight because of the O-rings. Mounting can be facilitated by appropriate greasing of the O-rings
- Insert sensor as far as it will go and secure with the three M3 Allen screws(1.5 Allen key)
- Refit cooler housing and tighten Philip screws



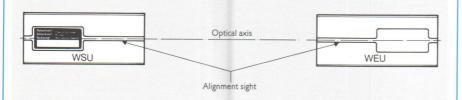
# Definitions

## **Definitions**

#### **Alignment**

With through-beam photoelectric switches, the sender and receiver should first of all be provisionally fitted. The devices should then be aligned in relation to each other, using the alignment sights. The sender is then pivoted horizontally until the signal strength indicator

(or status indicator) is positively lit (light-switching) or positively off (dark-switching). The sender should be tightened up in the middle of the reception range thus determined. The optical axis of the opposed devices should be as identical as possible.



Alignment of through-beam photoelectric switches using the alignment sight

With photoelectric reflex switches, the device should first of all be provisionally fitted. The reflector should be mounted within the normal-service scanning distance, at right angles to the center of the optical axis of the device. The switch

should then be pivoted horizontally and vertically until the signal strength indicator (or status indicator) is positively lit (light-switching) or positively off (dark-switching). The switch should then be tightened up.

#### **Alignment Insensitivity**

Whereas mirrors used as reflectors permit hardly any angular error, reflectors consisting of triple prisms permit angular errors of up to  $\pm 15^{\circ}$  in relation to the perpendicular to the direction of radiation.

#### **Alignment Sight**

Notch at the top of a device to facilitate alignment.

#### **Ambient Light**

Light from an extraneous source, in addition to light radiated by the light source of the photoelectric device onto the place being detected or into the device.

#### **Angular Reflection Scanner**



A photoelectric proximity switch in which the optical axes of the light sender and light receiver form an angle (DIN 440 30).

#### Autocollimation

Reflecting principle in which a light beam striking a reflector is reflected parallel to itself ("into itself").

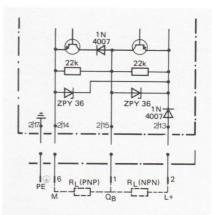
#### **Background Suppression**

Using a photoelectric method, the scanner only detects material surfaces within a defined scanning range.

Objects outside that range are not detected.

#### **B** Configuration

Output circuit permitting both NPN and PNP configurations, even at the same time. In contrast to an NPN configuration and PNP configuration, the output signal is neither approx. 0 V in the case of LOW, nor approx. +V in the case of HIGH. The transistor blocking voltage of approx. 1 V is always present.



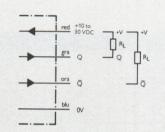
The B output can be operated both in NPN and PNP configurations.

#### **Blinking Threshold**

Response boundary at which the signal strength indicator starts to blink, thereby indicating a situation below the 50% operating margin/reserve.

#### Complementary

Complementary switching outputs Q and  $\overline{Q}$  can be used as light- and dark-switching outputs. When one signal is HIGH, the other is LOW.



Complementary switching outputs in NPN configuration

#### **Contrast Scanner**





Contrast scanners work according to the photoelectric proximity switch principle and are capable of detecting up to 15 different gray scale values between black and white.

#### Dark-switching

The switching output of a photoelectric device is activated (e.g. an output relay operated) when no light strikes the light receiver. With dark-switching, if the light receiver is not illuminated, the subsequent amplifier is "switched through" and the output relay is energized (pulled in). When the light receiver is illuminated, the relay is de-energized (dropped out).

	Status Output indicator Relay PNP		THE RESERVE TO SHARE	
Un- interrupted beam	8	OFF	LOW	HIGH
Interrupted beam	>⊗∈	ON	HIGH	LOW

"Dark-switching" truth table

#### Diaphragm - Mask

Mechanical component limiting beamarea.

#### **Diffuse Reflection**

Undirected return of radiation from non-mirroring surfaces.

#### **Enclosure Rating**

Classification of the protection of electrical equipment from electric shock, foreign bodies and water (DIN 400 50). A device with the rating IP 67 is completely safe against electric shocks, as well as being dusttight and watertight (immersion). IP 65, on the other hand, is safe against electric shocks and dusttight, but in relation to water it is only protected against sprayed water (from a nozzle), and not against immersion.

#### **Explosion (Ex) Protection**

Explosion protection required for devices in atmospheres prone to explosions.

#### Fiber-optic Cable

Bundle of glass or plastic fibers in which light can be conducted. Ideal applications include constricted areas and critical ambient conditions.

#### Filter

Optical filters only let through light waves in particular wavelength ranges and block other wavelength ranges. Electrical filters only let through signals in particular frequency ranges and block other frequency ranges.

#### **Incandescent Light**

(Constant Light)

Light with a largely constant radiation capacity (e.g. an incandescent lamp). The advantage of a relatively high light intensity is offset by the disadvantage of a "sluggish" behaviour which rules out modulation or pulsing of the light.

## Incandescent-light Operation

Operation of a photoelectric switch or proximity switch, in which the constant-light component of the luminous flux is evaluated in the light receiver.

#### Infrared (IR)

Radiation with a longer wavelength than visible light, with wavelengths between 0.75  $\mu m$  and 100  $\mu m$ . IR sender-diodes radiate in the infrared-A range with a wavelength of approx 0.8 to 0.95  $\mu m$ .

#### Life

The life of an LED or an incandescent lamp is defined as the time it takes to drop to half-power. In the case of an LED the value is related to an ambient operating temperature of +25°C. With an incandescent lamp for the specified operating voltage, lamp-life is reduced to one quarter by a 10% overvoltage and is extended by a factor of 4 by a 10% undervoltage.

#### **Light Spot**

Reproduction of the illumination area of the light source at a plane perpendicular to the optical axis.

#### Light-switching

When a photoelectric device is set at "light-switching", the switching output is active (e.g. a relay is energized) when light strikes the receiver. In through-beam and reflex applications this is the case when the beam is uninterrupted; in proximity applications, when the material being scanned is present.

If the light receiver is illuminated in light-switching mode, this implies that the amplifier has been "switched through" and that the output relay has been energized. The relay drops out when the beam is interrupted.

	Status indicator	Relay	Outpu PNP	t Q NPN
Un- interrupted beam	>⊗∈	ON	HIGH	LOW
Interrupted beam	8	OFF	LOW	HIGH

"Light-switching" truth table

#### **Limiting Scanning Distance**

Maximum distances between light sender and receiver or between photoelectric reflex switch and reflector. This value is a laboratory value determined with perfectly clean optical surfaces. Limiting scanning distances in the Technical Data are indicated as such.

The "limiting scanning distance" can also apply to the maximum distance between a photoelectric proximity switch and the surface of the material being scanned.

#### **Modulated Light**

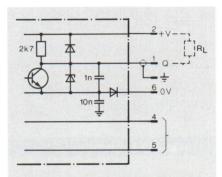
Light with a periodically varying radiation capacity. It involves indicating the light frequency and possibly the waveform (e.g. infrared or modulated).

#### **Modulated-light Operation**

Operation in which the modulated light component of the luminous flux is evaluated in the light receiver.

#### **NPN Output**

Output stage in which the load is at +V. Only when the output is at LOW potential does current flow through the load (e.g. a relay). If the output potential is HIGH, roughly the operating voltage is applied to the output; when it is LOW, on the other hand, a residual voltage of up to 1 V is applied.



NPN configuration of photoelectric switch output Q

#### Photoelectric Proximity Switch

An arrangement of one or more light sources illuminating a scanning plane by optical means. The light reflected by an object at the scanning plane is received by one or more photoelectronic components, which convert the luminous-flux variations into an electrical signal (DIN 440 30). Such devices are commercially available as photoelectric proximity switches (also as registration control scanners) and as angular reflection scanners.



A proximity switch in which the light sender and light receiver are located on the same side of the scanning plane. In the main, the switch detects diffusely reflecting surfaces or objects (DIN 440 30).

The basic condition of the photoelectric proximity switch is with no scanned material present. It switches when material is detected (lightswitching).

Switching output	Light-switching (Q)		Dark-switching (Q)	
Light received <sup>1</sup> )	yes	no	yes	no
Signal strength indicator	>⊗∈	8	<b>&gt;⊗</b> €	8
Load R <sub>L</sub>	energized	de-energized	de-energized	energized
PNP output	HIGH	LOW	LOW	HIGH
NPN output	LOW	HIGH	HIGH	LOW

1) = object present

Truth table for a photoelectric proximity switch



A photoelectric switch in which the light sender and light receiver are in the same housing. The light from the

sender is returned to the receiver by a reflector.

Depending on the type of device, the output signal is switched by a transistor, triac, thyristor or relay stage.

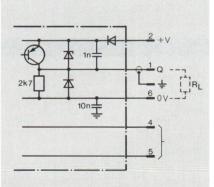
The basic condition of the photoelectric reflex switch is with an uninterrupted beam. It switches when the beam is broken (dark- switching).

Switching output	Light-switching (Q)		Dark-s	Dark-switching (Q)	
Light beam	uninterrupted	interrupted	uninterrupted	interrupted	
Signal strength indicator	>⊗<	8	>⊗€	8	
Load R <sub>L</sub>	energized	de-energized	de-energized	energized	
PNP output	HIGH	LOW	LOW	HIGH	
NPN output	LOW	HIGH	HIGH	LOW	

Truth table for a photoelectric reflex switch

#### **PNP Output**

Output stage in which the load is at 0 V. Only when the output is at HIGH potential does current flow through the load (e.g. a relay). If the output potential is LOW, approx. 0 V is present at the output; when it is HIGH, on the other hand, it is approx. 1.5 V short of +V.



PNP configuration of photoelectric switch output Q

#### **Polarized Light**

Light which does not oscillate in arbitrary planes, like natural light, but in just one plane.

#### **Polarizing Filter**

Filter (e.g. plastic foil with stripes) for producing polarized light.

#### **Power Indicator**

An indicator (usually in the form of an LED), which indicates (on the sender of a through-beam photoelectric switch, for example) that the operating voltage is applied.

#### **Red Light**

Visible light in the red range between 600 and 780 nm. Red-light sender diodes emit in the red-light range with a wavelength of 630 to 690 nm.

#### Reflection

Return of radiation impinging on the interface between two media. Directed or mirroring reflection is "mirroring": radiation is sent back in only one direction. If it is returned in a large number of directions, it is described as "diffuse reflection."

#### Retroreflecting

Description applicable to an optical component which reflects light equally well back to itself, i.e. to the light source, provided the light strikes roughly perpendicularly. Triple reflectors permit a tolerance of  $\pm 15^\circ$ .

#### **Scanning Distance**

(Normal-service scanning distance)

Distance between light sender and light receiver or between photo-electric reflex switch and reflector, within which reliable operation of the device concerned is ensured under industrial conditions. A certain amount of dirt on the device does not affect its operation.

Values given in the Technical Data without further amplification are normal-service scanning distances.

## **Definitions**

#### **Signal Strength Indicator**

An indicator (generally in the form of an LED), which indicates whether the device has switched, but also indicates by a blinking mode that, say, the signal reserve remaining is only 50%.

The indicator can be used to monitor dirt build-up on the optics, giving timely warning of breakdown of the system. It can also be used for precise alignment of devices.

Light received	Signal strength indicator	Photoelectric switch
good	>⊗∈	switches
margin ≦50%	≅⊗≅(blink.)	switches
none	8	does not switch

Truth table for signal strength indicator

#### **Status Indicator**

An indicator (usually in the form of an LED), which indicates that the output stage of the device has switched (e.g. the relay has been energized). A blinking mode as with the signal strength indicator is not possible.

#### **Switching Threshold**

Response boundary at which a switching operation is triggered.

#### **Temperature Measuring Instruments**





Temperature measuring instruments are non-contact temperature sensors which convert infrared radiation from any object into an electrical signal.

The instrument is capable of measuring and switching, even with moving objects. Measuring range 0 to 2000 °C, depending on the model. Analogue measuring output 1 to 5 V, 1 mV/°C or F (switch-selectable). Limit-value switching output; adjustable switching threshold.

#### **Through-beam Photoelectric Switch**





A photoelectric switch in which the light from the sender is directed towards a receiver which is physically and optically separate from it (DIN 440 30).

Depending on the model, the receiver includes an amplifier and output stage with a transistor output or relay output. Long scanning distances can be achieved with through-beam photoelectric switches. The basic state of the switch is with the beam uninterrupted – it switches when the beam is broken (darkswitching).

Switching output	Light-switching (Q)		Dark-sv	Dark-switching (Q)	
Light beam	uninterrupted	interrupted	uninterrupted	interrupted	
Signal strength indicator	>⊗∈	8	>⊗∈	8	
Load R <sub>L</sub>	energized	de-energized	de-energized	energized	
PNP output	HIGH	LOW	LOW	HIGH	
NPN output	LOW	HIGH	HIGH	LOW	

Truth table for a through-beam photoelectric switch

#### **Triple Reflector**

Pyramid-shaped body whose three side faces form on angle of exactly 90°. Light entering through the base is reflected parallel to itself. Linearly polarized light is also rotated in its polarization plane. Maloperation by

"mirroring" material is thereby prevented in a photoelectric reflex switch.

# Optoelectronics from SICK

Automated industrial processes call for proven and reliable technologies to solve the nummerous problems.

Light is the perfect medium for the acquisition of data on goods and for the automation of manufacturing processes. It does not affect the environment, it is quick and non-distructive. SICK have been specialising in this technology for more than 40 years and even apart from industry, the company has opened up numerous fields of application.

- Photoelectric switches and proximity switches for automation.
- Safety light curtains and grids for accident prevention at danger points and areas and for guarding entries.
- Emission monitors and analyzers for monitoring pollutant concentrations, special sensors for traffic security.
- Bar code identification systems for the acquisition of process data and for material-flow control.
- Image processing systems and laser scanners for a wide variety of tasks in quality control.

We know the solution to many application problems and offer reliable, high-quality opto-electronical systems and sensors — just contact us.

#### **Automation technology**

SENSICK photoelectric switches and proximity switches have become essential components in industry. Wherever objects have to be detected reliably, wherever processes must be monitored or controlled — it's SENSICK sensors which are used. And since SENSICK stands for high-quality products, these sensors guarantee cost-effective manufacturing without any problems.



The applications are as nummerous as the ambient and the operating conditions. This catalogue details through-beam, reflex and proximity type photoelectric switches. The range of our products also includes contrast scanners, luminescence scanners and the TM 20 Temperature measuring Instrument which provides non-contact measurement of heat.



Safety Light curtains and grids which reliably guard dangerous machines and plant are also ideal for the protection of areas. Photoelectric safety switches and the OTD rotating-beam light curtain ensure effective access protection.

Entry and exit guarding on doors of public transport vehicles, lifts and within warehouses are areas for which a separate range of products have been developed.

Two special catalogues provide information on how our products offer effective accident prevention whilst maintaining production efficiency.

#### Safety technology

Opto-electronical safety systems from SICK are used for presence sensing monitoring of danger areas on presses and punches as well as for guarding the access to machines and plants.



# **Opto-electronics from SICK**

#### **Environmental systems**

Today, protection of the environment stands in the centre of the public interest and an enormous effort together with reliable control systems are required to keep to the legally



prescribed or recommended limit values. Pollutant concentrations of gases and dust, which are emitted e.g.

by large-size furnaces and refuse incinerators, are determined by dust density monitors and gas analyzers from SICK.

SICK traffic sensors help to control traffic and to avoid accidents. They inform on any reduction of visibility — caused by fog, rain, snow etc. — on roads and highways, they record ground visibility at airports and detect visibility and pollutant concentrations in tunnels.

Our catalogues and brochures provide information on the complete range of devices and on typical applications. Dynamic V scanners and parallel scanners are used for a varying height of the reading plane or a varying distance and read all current types of bar codes.

Hand-held bar code readers such as wands and laser scanners, decoders and data terminals with integrated decoders make the range of products complete. Finally, the ISD 100 IR Data Transmission System provides wireless data transmission.

A special catalogue informs you on these systems, on applications and our engineering services for process data detection.

#### **Automatic identification**

Materials flow is not only controlled by photoelectric switches and proximity switches but also by bar code reading systems which reliably detect the process data. Bar code readers are used for safe data detection and transmission, capable of being synchronized with either rapid processes or a manual process-



orientated operation. SICK offers many solutions from one source: be it an individual portable device or a complete network system.

#### **Quality control**

Requirements concerning the quality of manufactured goods steadily rise.

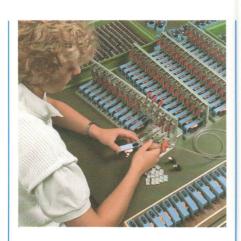


Image processing systems and the SICK Laser Scan System allow reliable control of manufactured products. These systems have been developed especially for rapidly moving web-type materials, such as paper, textiles, metals and even for coated films and foils. And we also use light to solve special application problems like inspecting laser disks, optic and magnetic data carriers and the properties of textiles.

Please ask for detailed information.



## SICK Service. Worldwide.



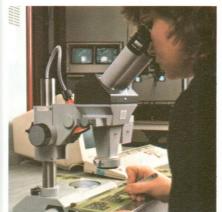
Reliable devices are accompanied by reliable service.

SICK products are fully backed by product support engineers who can discuss customers applications and advise on the selection of the correct devices and their installation.

At SICK, service means comprehensive quality checks to prevent expensive nonproductive downtime. Opto-electronic systems from SICK are applied wherever reliability is a prerequisite for uninterrupted processes. Therefore, every component is put through severe

France, the Netherlands, Belgium, Switzerland, Great Britain, Denmark, Spain, Australia, Finland, Japan, Singapore, USA.





tests in the SICK quality control department. This ensures that only high-quality products leave the works. And if problems do ever arise, just call us, SICK service engineers are there to offer prompt and reliable assistance. Not only in Germany, but also at the SICK subsidiaries in

# **Branches and Agencies**





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5304160	LLK 1-A 6		6007306	Cable receptacle,		6008952	WL 260-P230	131
	fiber-optic cable	48		4-pin, right angle (AC)	151	6008953	WL 260-N230	131
5304161	LLK 1-D 3		6007355	WS 6, WE 6-P132	41	6008954	WT 260-P 230	133
	fiber-optic cable	48	6007356	WS 6, WE 6-N132	41	6008955	WT 260-N 230	133
5304162	LLK 1-D 4		6007411	WS 5-D132, WE 5-P132	33	6009427	MV 10	175
	fiber-optic cable	48	6007412	WS 5-D 132,				
5304163	LLK 1-C 5	5050	-	WE 5-N132	33			
	fiber-optic cable	48	6007810	TM 20-11112	223			
5304164	LLK 1-C 6	10	6007811	TM 20-11122	223			
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5304165	LLK 1-M 5	70	6007812	TM 20-11142	223			
J3U4103	fiber-optic cable	48	6007813	TM 20-21112	225			
5204144	LLK 1-M 6	10	6007815	TM 20-21122	225			
5304166	fiber-optic cable	48	6007813	TM 20-31152	227			
	inter-optic capie	70	1 000/010	11120 31132	221			

48 6007816

TM 20-31152

fiber-optic cable



optic electronic

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